



01 October 2019

Dan McCain
Unit Manager
Industrial Monitoring Program
Georgia Department of Natural Resources
Environmental Protection Division
Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, Georgia 30354-3908

Dear Mr. McCain:

RE: Permit 3841-217-0021-S-04-0 Performance Testing

Enclosed is the Emission Control System Performance Testing Report for the voluntary testing we conducted at our Covington location on 11-12 September 2019. The report demonstrates that our emission control equipment is in compliance with the requirements for destruction efficiency. This report demonstrates compliance for sterilizer chamber vent, and the aeration rooms.

The tests were conducted at or below our required Compliance Temperature, therefore the Compliance Temperature should not change.

If you have any questions regarding this information, please contact me at (770) 784-6186.

Sincerely,

A handwritten signature in blue ink, appearing to read "John LaMontagne".

John LaMontagne
Process Technology Engineer
UCC and Critical Care Division
Becton, Dickinson and Company

cc: R. Pasdon

Certified: 7009 2250 0001 2747 4804

**REPORT OF
AIR POLLUTION SOURCE TESTING
OF AN ETHYLENE OXIDE EMISSION-CONTROL SYSTEM
OPERATED BY BECTON DICKINSON AND COMPANY (BD)
IN COVINGTON, GEORGIA
ON SEPTEMBER 11-12, 2019**

Submitted to:

**GEORGIA DEPARTMENT OF NATURAL RESOURCES
Environmental Protection Division
4244 International Parkway, Suite 120
Atlanta, Georgia 30354**

Submitted by:

**BECTON DICKINSON AND COMPANY (BD)
Urology and Critical Care Division
8195 Industrial Boulevard
Covington, Georgia 30014**

GDNR Permit No. 3841-217-0021-S-03-0

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Prepared by:

**ECSI
PO Box 1498
San Clemente, California 92674**

Prepared on:

September 25, 2019

ECSI

CONTACT SUMMARY

CLIENT

Mr. John LaMontagne
Facilities Manager
BECTON DICKINSON AND COMPANY (BD)
Urology and Critical Care Division
8195 Industrial Boulevard
Covington, Georgia 30014

Phone: (770)784-6186
Fax: (770)788-5519
email: john.lamontagne@bd.com

TEST DATE

September 11-12, 2019

REGULATORY AGENCY

GEORGIA DEPARTMENT OF NATURAL RESOURCES
Environmental Protection Division, Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, Georgia 30354

Phone: (404)363-7000
FAX: (404)363-7100

TESTING CONTRACTOR

Daniel P. Kremer
President
ECSi, Inc.
PO Box 1498
San Clemente, California 92674

Phone: (949)400-9145
FAX: (949)281-2169
email: dankremer@ecsi1.com

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1.0 INTRODUCTION

On September 11-12, 2019, ECSi performed air pollution source testing of an ethylene oxide (EtO) emission-control system operated by Becton Dickinson and Company (BD) in Covington, Georgia. The control device tested was a Regenerative Thermal Oxidizer (RTO), which is currently used to control emissions from five ethylene oxide sterilizers, and the aeration cells used in the aeration process. The purpose of the testing program was to demonstrate continued compliance with the conditions established in the Air Quality Permit granted to BD by the Georgia Department of Natural Resources, Environmental Protection Division (GDNR).

2.0 EQUIPMENT

The EtO gas-sterilization system is comprised of five commercial sterilizers, all discharging through vacuum pumps to an RTO emission control device. The ten aeration cells used in the aeration process are also discharged to the RTO. The gas-sterilization and emission-control equipment consists of the following:

- Five Gas Sterilizers, each comprised of a steam-heated sterilization chamber, a liquid ring recirculating vacuum pump chamber evacuation system ("chamber vacuum vent"), and a backdraft valve ("chamber backvent");
- Ten Aeration cells, each comprised of a heated aeration chamber and a chamber exhaust system.

Sterilizer vacuum pump and aeration cell emissions are controlled by:

- Regenerative Thermal Oxidizer (RTO), equipped with a high pressure supply fan, and natural gas fired burner, a combustion chamber, and an exhaust system.

3.0 TESTING

EtO source testing was conducted in accordance with the procedures outlined in USEPA CFR40, Part 63.365(d)(2) and with the procedures outlined in CARB Method 431, the USEPA approved alternate method to the procedures listed in CFR40, Part 63.365, subpart O. EtO concentration measurement for each test run was conducted simultaneously at the inlet and outlet of the oxidizer during a one-hour interval of the aeration process, and during the first chamber evacuation of the sterilizer exhaust phase of one of the five sterilizers. A total of three one-hour aeration test runs and three exhaust-phase test runs were performed.

During aeration testing, EtO concentration at the inlet and the outlet of the catalytic oxidizer was determined using direct source sample injection into the gas chromatograph (GC). During the first chamber evacuation of the exhaust phase, EtO emissions to the inlet of the oxidizer were determined using the Ideal Gas Law and the chamber conditions at the beginning and at the end of the first chamber evacuation. During the first chamber evacuation of the exhaust phase, EtO emissions from the outlet of the oxidizer were determined using direct source sample injection into the GC.

All aeration testing was performed using recently sterilized product. The testing program was conducted in accordance with the procedures outlined in the following sections.

4.0 RULE/COMPLIANCE REQUIREMENTS

The EtO gas-sterilization system at BD was tested to demonstrate compliance with USEPA requirements, as specified in the GDNR Air Quality Permit. The following requirements must be met:

- The aeration and sterilizer exhaust phase (post exposure vacuum pulses) emissions must be vented to control equipment with an EtO emission-reduction efficiency of at least 99 % by weight.

Testing is required to demonstrate compliance with these requirements. Source testing of the RTO is required initially, and may be required periodically thereafter.

5.0 TEST METHOD REFERENCE

5.1 INTRODUCTION

EtO source testing was conducted in accordance with the procedures outlined in USEPA CFR40, Part 63.365(d)(2) and with the procedures outlined in CARB Method 431, the USEPA approved alternate method to the procedures listed in CFR40, Part 63.365, subpart O. EtO concentration measurement for each test run was conducted simultaneously at the inlet and outlet of the oxidizer during a one-hour interval of the aeration process, and during the first chamber evacuation of the sterilizer exhaust phase of one of the five currently operating sterilizers. A total of three one-hour aeration test runs and three exhaust-phase test runs were performed.

During aeration testing, EtO concentration at the inlet and the outlet of the catalytic oxidizer was determined using direct source sample injection into the gas chromatograph (GC). During the first chamber evacuation of the exhaust phase, EtO emissions to the inlet of the oxidizer were determined using the Ideal Gas Law and the chamber conditions at the beginning and at the end of the first chamber evacuation. During the first chamber evacuation of the exhaust phase, EtO emissions from the outlet of the oxidizer were determined using direct source sample injection into the GC.

All aeration testing was performed using recently sterilized product.

Operation and documentation of process conditions were performed by personnel from BD using existing monitoring instruments installed by the manufacturer on the equipment to be tested. In accordance with the procedures established in USEPA CFR40, Part 63, Subpart O, Section 63.363(b)(3), the following parameter was recorded: oxidizer operating temperature.

5.2 VOLUMETRIC FLOW MEASUREMENT

During sterilizer exhaust phase testing, exhaust gas flow at the outlet of the RTO was determined by 40 CFR 60, Appendix A, Method 2, using an s-type pitot tube and an inclined-oil manometer. Sampling ports were located in accordance with 40 CFR 60, Appendix A, Method 1. The test ports were located far enough from any flow disturbances to permit accurate flow measurement.

Temperature measurements were obtained from a type K thermocouple and thermometer attached to the sampling probe. Exhaust gas composition was assumed to be air and small amounts of water vapor. Water vapor was negligible and, based on previous test data, a value of 2 percent was used for flow calculations.

5.3 ETO CONCENTRATION AND MASS EMISSIONS MEASUREMENT

During the first chamber evacuation of the sterilizer exhaust phase, the mass emissions of EtO vented to the inlet of the scrubber were determined using the procedures outlined in CFR40, Part 63.365. This method allows the determination of the mass of EtO vented to the inlet of the scrubber through calculations based on the Ideal Gas Law and using the conditions (pressure, temperature, volume) of the sterilization chamber immediately after it has been charged with sterilant gas, and upon conclusion of the first chamber evacuation of the exhaust phase.

The mass of EtO vented to the inlet of the scrubber during the first chamber evacuation of the exhaust phase was determined by calculating the mass of EtO present in the chamber after the first chamber evacuation and subtracting it from the mass of EtO present in the chamber after it had been charged with sterilant gas. The mass of EtO present in the chamber was calculated using Equation 1, shown below in Section 5.9.

During the first chamber evacuation of the sterilizer exhaust phase, EtO emissions from the outlet were determined using direct source sample injection into the GC. During aeration testing, EtO emissions at the inlet and outlet were determined using direct source sample injection into the GC. The mass of EtO emitted from the outlet was determined using Equation 2, shown below in Section 5.9. Mass-mass control-efficiency of EtO during aeration and exhaust was calculated by comparing the mass of EtO vented to the system inlet to the mass of EtO vented from the system outlet.

During aeration and exhaust phase testing, vented gas was analyzed by an SRI, Model 8610, portable gas chromatograph (GC), equipped with the following: dual, heated sample loops and injectors; dual columns; and dual detectors. A flame ionization detector (FID) was used to quantify inlet EtO concentration, and a photoionization detector (PID) was used to quantify low-level EtO concentration at the emission-control device outlet.

5.4 SAMPLE TRANSPORT

Source gas was pumped to the GC at approximately 1000 cubic centimeters per minute (cc/min) from the sampling ports through two lengths of Teflon® sample line, each with a nominal volume of approximately 75 cubic centimeters (cc) and an outer diameter of 0.25 inch. At the inlet, the sampling port was located in the aeration discharge duct, upstream of the oxidizer. At the outlet of the oxidizer, sampling ports were located in the exhaust stack.

5.5 GC INJECTION

Source-gas samples were then injected into the GC which was equipped with two heated sampling loops, each containing a volume of approximately 2cc and maintained at 100 degrees Celsius (C). Injections occurred at approximately one to two-minute intervals during exhaust phase testing, and at approximately five-minute intervals during aeration testing. Helium was the carrier gas for both the FID and PID.

5.6 GC CONDITIONS

The packed columns for the GC were both operated at 90 degrees C. The columns were stainless steel, 6 feet long, 0.125 inch outer diameter, packed with 1 percent SP-1000 on 60/80 mesh Carbopack B. During the analysis, the FID was operated at 250 degrees C. The support gases for the FID were helium (99.999% pure), hydrogen (99.995% pure) and air (99.9999% pure). Any unused sample gas was vented from the GC system back to the inlet of the control device being tested.

5.7 CALIBRATION STANDARDS

The FID was calibrated for mid-range part-per-million-by-volume (ppmv) level analysis using gas proportions similar to the following:

- 1) 100 ppmv EtO, balance nitrogen
- 2) 50 ppmv EtO, balance nitrogen (audit gas)
- 3) 10 ppmv EtO, balance nitrogen
- 4) 1 ppmv EtO, balance nitrogen

The PID was calibrated for low-range ppmv level analyses using gas proportions similar to the following:

- 1) 100 ppmv EtO, balance nitrogen
- 2) 50 ppmv EtO, balance nitrogen (audit gas)
- 3) 10 ppmv EtO, balance nitrogen
- 4) 1 ppmv EtO, balance nitrogen

Each of these calibration standards was in a separate, certified manufacturer's cylinder. Copies of the calibration gas laboratory certificates are attached as Appendix I.

5.8 SAMPLING DURATION

Exhaust phase testing consisted of three 20-minute test runs, which encompassed the entire duration of the first chamber evacuation. Since the aeration process entails a constant discharge flow from the aeration chambers to the oxidizer, aeration testing consisted of three 1-hour test runs. Each test run was performed with freshly sterilized product in the aeration cells.

5.9 CONTROL-EFFICIENCY/MASS-EMISSIONS CALCULATIONS

The following equation was used to calculate mass of EtO discharged to the inlet of the emission-control system during the first chamber evacuation of the sterilizer exhaust phase:

EQUATION 1:

$$W_c = W_{ci} - W_{cf}$$

Where:

W_c = Weight of EtO discharged from the sterilization chamber to the emission-control system during the first chamber evacuation, pounds

$$W_{ci} = (mw)(p)(P)(V)/(R)(T)$$

(and W_{cf})

Where:

W_{ci} = Weight of EtO present in the sterilization chamber before the first chamber evacuation, pounds

W_{cf} = Weight of EtO present in the sterilization chamber after the first chamber evacuation, pounds

MW = Molecular weight of EtO, 44.05 lb/mol

p = Percent of EtO in chamber

$$= W_s/W_i$$

Where:

W_s = Scale-measured weight of EtO charged into sterilization chamber

W_i = Calculated weight of EtO charged into sterilization chamber (@ 100%)

P = Sterilization chamber pressure (after charging/at the end of the 1st evac), psia

V = Sterilization chamber volume, ft³

R = Gas constant, 10.73 psia·ft³/mol·°R

T = Sterilization chamber temperature (after charging/at the end of the 1st evac), °R

Note: Standard conditions are 68°F and 1 atm.

Outlet mass emissions of EtO during the exhaust phase were calculated using the following equation:

EQUATION 2:

$$\text{MassRate} = (\text{VolFlow})(\text{MolWt})(\text{ppmv EtO}/10^6)/(\text{MolVol})$$

Where:

MassRate = EtO mass flow rate, pounds per minute

VolFlow = Corrected volumetric flow rate, standard cubic feet per minute at 68 degrees F

MolWt = 44.05 pounds EtO per pound mole

ppmv EtO = EtO concentration, parts per million by volume

10^6 = Conversion factor, ppmv per "cubic foot per cubic foot"

MolVol = 385.32 cubic feet per pound mole at one atmosphere and 68 degrees F

Results of the control-efficiency testing are presented in Section 8.0, and in Tables 1 and 2.

6.0 TEST SCENARIO

Aeration and exhaust testing was performed during normal process load conditions. Three aeration test runs and three exhaust runs were conducted in series to verify the performance of the emission-control device. The testing schedule was as follows:

- 1) Testing equipment was set up and calibrated.
- 2) Aeration Test Run #1 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the oxidizer.
- 3) Aeration Test Run #2 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the oxidizer.
- 4) Aeration Test Run #3 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the oxidizer.
- 5) Exhaust Test Run #1 was conducted. Sampling was performed at the outlet of the oxidizer.
- 6) Exhaust Test Run #2 was conducted. Sampling was performed at the outlet of the oxidizer.
- 7) Exhaust Test Run #3 was conducted. Sampling was performed at the outlet of the oxidizer.
- 8) Post calibration check was performed, testing equipment was packed.

7.0 QA/QC

7.1 FIELD TESTING QUALITY ASSURANCE

At the beginning of the test, the sampling system was leak checked at a vacuum of 15 inches of mercury. The sampling system was considered leak free when the flow indicated by the rotameters fell to zero.

At the beginning of the test, a system blank was analyzed to ensure that the sampling system was free of EtO. Ambient air was introduced at the end of the sampling line and drawn through the sampling system line to the GC for analysis. The resulting chromatogram also provided a background level for non-EtO components (i.e. ambient air, carbon dioxide, water vapor) which are present in the source gas stream due to the ambient dilution air which is drawn into the emission-control device, and due to the destruction of EtO by the emission-control device which produces carbon dioxide and water vapor. This chromatogram, designated AMB, is included with the calibration data in Appendix A.

7.2 CALIBRATION PROCEDURES

The GC system was calibrated at the beginning and conclusion of each day's testing. Using the Peaksimple II analytical software, a calibration curve was constructed for each detector. A gas cylinder of similar composition as the calibration gases, but certified by a separate supplier, was used to verify calibration gas composition and GC performance.

All calibration gases and support gases used were of the highest purity and quality available. A copy of the laboratory certification for each calibration gas is attached as Appendix I.

8.0 TEST RESULTS

The oxidizer was found to have an average EtO control efficiency of 99.97% for the aeration process, and 99.9993% for the chamber exhaust. In accordance with state and federal requirements, backvent and aeration discharge streams must be vented to control equipment with an EtO emission-reduction efficiency of at least 99 percent by weight. The oxidizer met this requirement.

The test results are summarized in Tables 1 and 2. These tables include results for EtO control efficiency of the emission-control device for aeration and exhaust. Chromatograms and chromatographic supporting data are attached as Appendices A through G. Copies of field data and calculation worksheets are attached as Appendix H.

TABLES

TABLE 1
ETHYLENE OXIDE CONTROL EFFICIENCY - AERATION
OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE
OPERATED BY CR BARD, INC.
IN COVINGTON, GEORGIA
ON SEPTEMBER 11, 2019

RUN NUMBER	INJECTION TIME	INLET ETO CONC. (PPM)(1)	OUTLET ETO CONC. (PPM)(2)	ETO CONTROL EFFICIENCY
1(3)	1450	63.2	0.018	99.9715
1	1455	68.1	0.018	99.9736
1	1500	70.2	0.018	99.9744
1	1505	70.7	0.018	99.9745
1	1510	72.1	0.018	99.9750
1	1515	72.9	0.018	99.9753
1	1520	72.7	0.018	99.9752
1	1525	74.3	0.018	99.9758
1	1530	73.3	0.018	99.9754
1	1535	72.8	0.018	99.9753
1	1540	73.1	0.018	99.9754
1	1545	72.0	0.018	99.9750
2(4)	1550	71.3	0.018	99.9748
2	1555	72.9	0.018	99.9753
2	1600	72.9	0.018	99.9753
2	1605	70.3	0.018	99.9744
2	1610	69.1	0.018	99.9740
2	1615	70.7	0.018	99.9745
2	1620	68.7	0.018	99.9738
2	1625	69.9	0.018	99.9742
2	1630	67.8	0.018	99.9735
2	1635	69.3	0.018	99.9740
2	1640	67.7	0.018	99.9734
2	1645	67.4	0.018	99.9733
3(5)	1650	65.6	0.018	99.9726
3	1655	68.0	0.018	99.9735
3	1700	65.6	0.018	99.9726
3	1705	65.2	0.018	99.9724
3	1710	65.6	0.018	99.9726
3	1715	66.7	0.018	99.9730
3	1720	68.7	0.018	99.9738
3	1725	69.2	0.018	99.9740
3	1730	68.8	0.018	99.9738
3	1735	67.3	0.018	99.9733
3	1740	64.6	0.018	99.9721
3	1745	<u>63.4</u>	<u>0.018</u>	<u>99.9716</u>
TIME-WEIGHTED AVERAGE:		69.23	0.0180	99.9739
GDNR REQUIRED CONTROL EFFICIENCY:				99%

Notes:

- (1) - PPM = parts per million by volume
- (2) - 0.01 ppm is the quantification limit for the detector used at the outlet.
- (3) - Aeration Phase Test Run #1 started at 14:48, ended at 15:48.
- (4) - Aeration Phase Test Run #2 started at 15:48, ended at 16:48.
- (5) - Aeration Phase Test Run #3 started at 16:48, ended at 17:48.

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TABLE 2
COMPLIANCE TESTING RESULTS
ETHYLENE OXIDE CONTROL EFFICIENCY AND MASS EMISSIONS
OF AN ETHYLENE OXIDE EMISSION CONTROL SYSTEM
OPERATED BY CR BARD, INC.
IN COVINGTON, GA
ON SEPTEMBER 12, 2019

EXHAUST PHASE - STERILIZER VACUUM VENT

Run #	Chamber Number	Stack Flow (dscfm) (1)	Average Outlet Conc. (ppm) (2)	Outlet EtO Mass Flow (lbs/min) (3)	Minutes/Cycle	Outlet EtO Mass Emissions (lbs)	Inlet EtO Mass Emissions (lbs)	EtO Control Efficiency (%)
1	2	11600	0.018	0.0000239	21	0.0005019	75.1	99.9993
2	3	11800	0.018	0.0000242	22	0.0005320	75.8	99.9993
3	4	11800	0.018	0.0000243	21	0.0005103	74.2	99.9993
Average EtO Control Efficiency:								99.9993

Notes: (1) - DSCFM = dry standard cubic feet per minute
(2) - PPM = parts per million by volume
(3) - LBS/MIN = EtO emissions, pounds per minute

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APPENDICES

APPENDIX A
Calibration Data

LOD (2)

LOD Calculation EtO

CR Bard - Covington, GA

9/11/2019

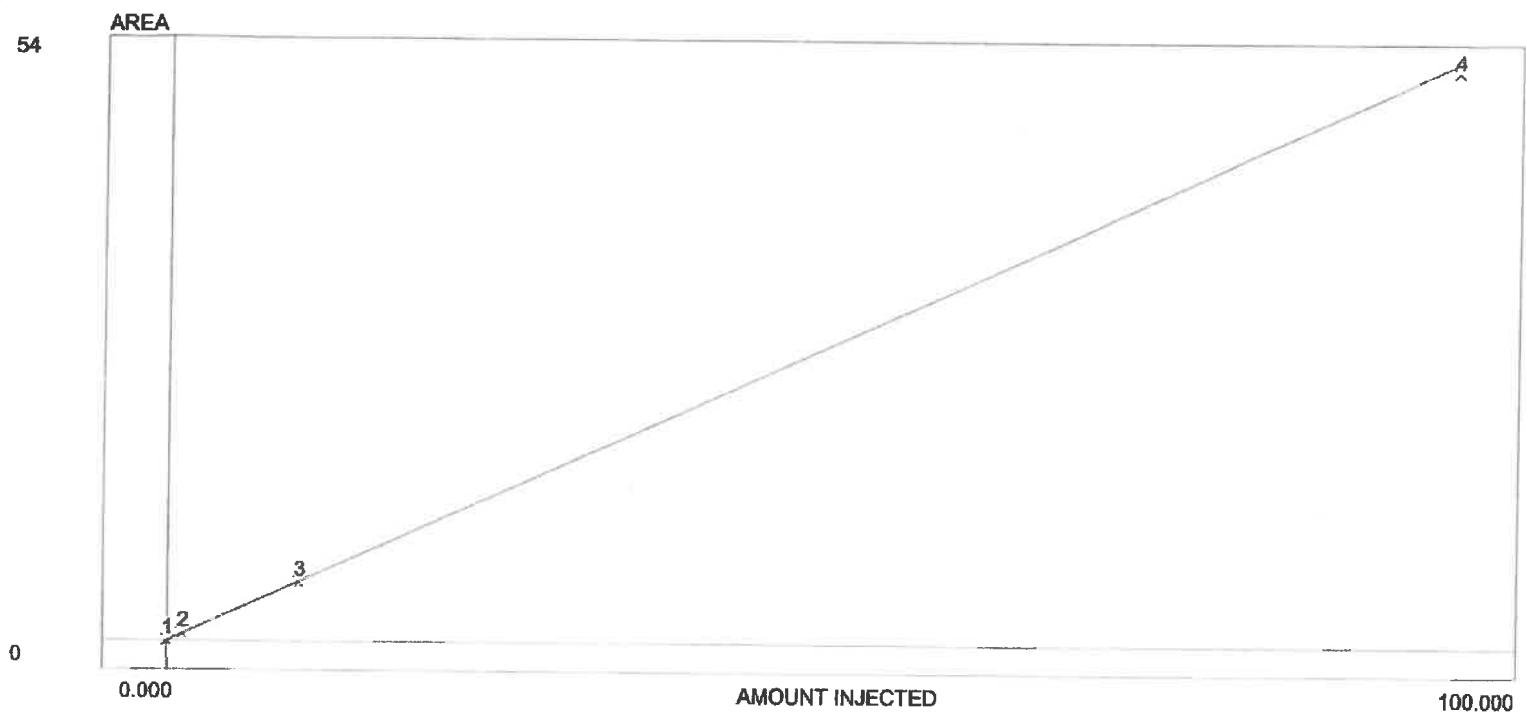
Outlet	Y = A + m x			
	ppm	=	2.87E-02	+ 0.150183 x area
Lowest Cal Gas				
Area	Calc ppm		LOD = A+3s	
7.51	1.157 ppm		LOD = 0.036 ppm	
7.48	1.152 ppm			
7.50	1.155 ppm			
AVG	1.155 ppm			
Std Dev	0.002 ppm			
1/2 LOD = 0.018 ppm				

Inlet	Y = A + m x			
	ppm	=	-0.52	+ 1.87 x area
Lowest Cal Gas				
Area	Calc ppm		LOD = A+3s	
0.655	0.704 ppm		LOD = 0.546 ppm	
0.663	0.719 ppm			
0.659	0.711 ppm			
AVG	0.711 ppm			
Std Dev	0.007 ppm			
1/2 LOD = 0.273 ppm				

Component file: eto1-100.cpt

Peak	Name	Start	End	Calibration	Int.Std	Units
1	Dead Vol / Air	0.000	0.280		0.000	
2	Ambient H2O	0.280	0.400		0.000	
3	Ethylene Oxide	0.400	0.510	C:\peak454-64bit\0.000\1C ppm\rdCov2019.CAL		
4	Acetaldehyde	0.510	1.000		0.000	

54



Avg slope of curve: 0.54

Y-axis intercept: 0.00

Linearity: 1.00

Number of levels: 4

SD/rel SD of CF's: 0.3/66.7

Y=0.5439X

r²: 1.0000

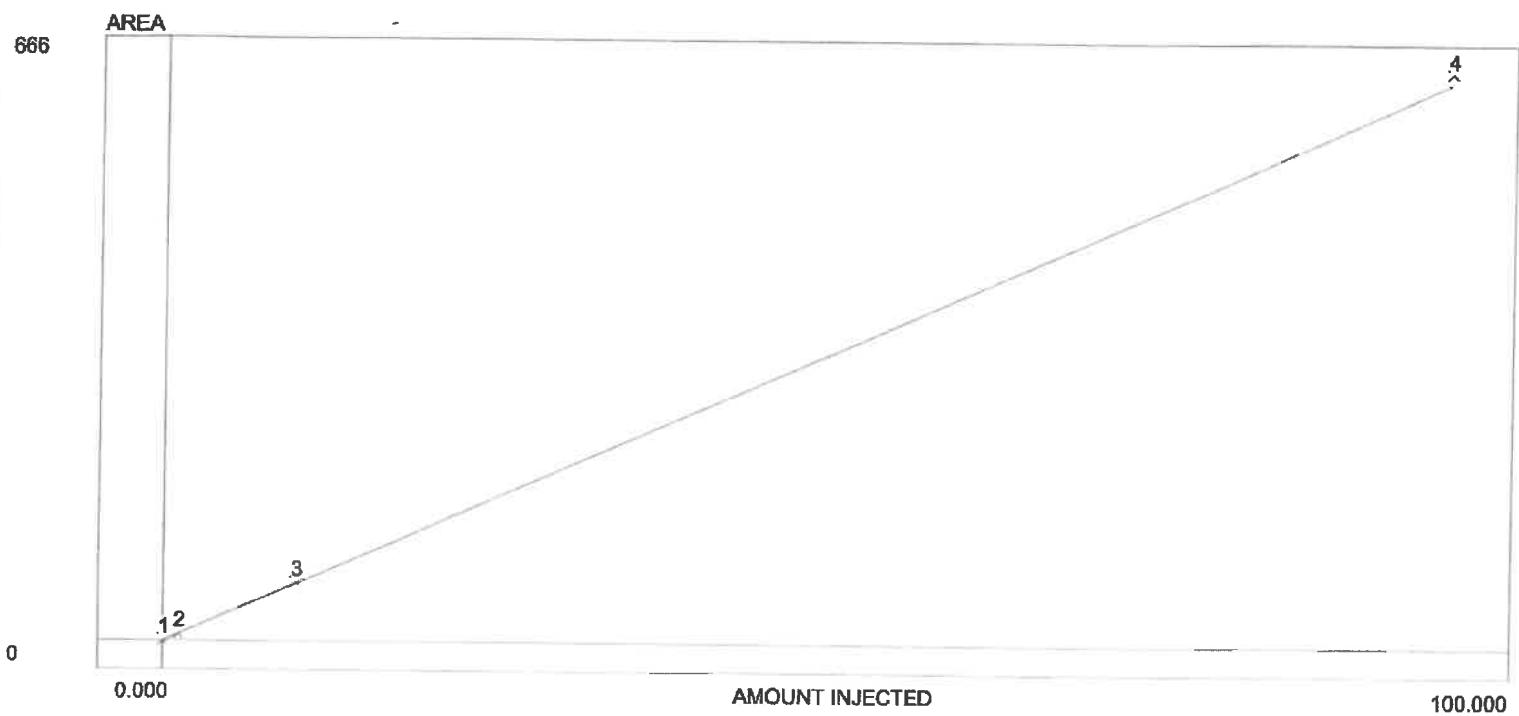
Last calibrated: Wed Sep 11 13:48:42 2019

Lvl.	Area/ht.	Amount	CF	Current	Previous #1	Previous #2
1	0.000	0.000	0.000	0.000	N/A	N/A
2	0.659	1.180	0.558	0.659	N/A	N/A
3	5.490	10.200	0.538	5.490	N/A	N/A
4	53.500	100.000	0.535	53.500	N/A	N/A

Component file: eto2-100.cpt

Peak	Name	Start	End	Calibration	Int.Std	Units
1	Dead Vol / Air	0.000	0.280		0.000	
2	Ambient H2O	0.280	0.400		0.000	
3	Ethylene Oxide	0.400	0.510	C:\peak359\2CRB0.000\0v2ppmCAL		
4	Acetaldehyde	0.510	1.000		0.000	

Calibration file: C:\peak359\2CRBardCov2019.CAL



Avg slope of curve: 6.55

Y-axis intercept: 0.00

Linearity: 1.00

Number of levels: 4

SD/rel SD of CF's: 3.3/66.7

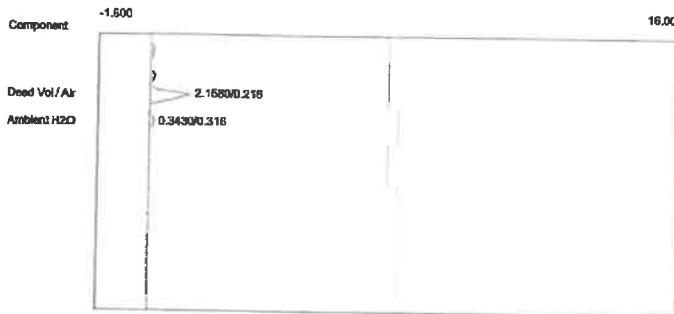
Y=6.5511X

r²: 1.0000

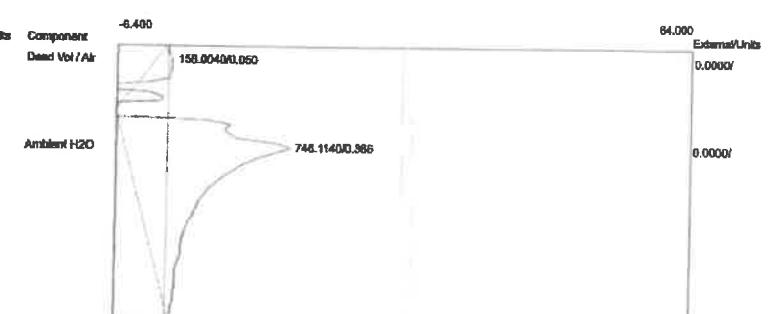
Last calibrated: Wed Sep 11 14:19:25 2019

Lvl.	Area/ht.	Amount	CF	Current	Previous #1	Previous #2
1	0.000	0.000	0.000	0.000	N/A	N/A
2	7.500	1.180	6.356	7.500	N/A	N/A
3	67.700	10.200	6.637	67.700	N/A	N/A
4	666.000	100.000	6.660	666.000	N/A	N/A

Lab name: ECSI
 Client: CR Bard - Covington, GA
 Client ID: PreCal
 Analysis date: 09/11/2019 12:51:18
 Method: Direct Injection
 Description: CHANNEL 1 - FID
 Column: 1% SP-1000, CarboPack B
 Carrier: HELIUM
 Temp. prog: eto-100.term
 Components: eto1-100.cpt
 Data file: 1CRBardCov2019-Amb.CHR (c:\peak359)
 Sample: Ambient Background
 Operator: D. Kremer



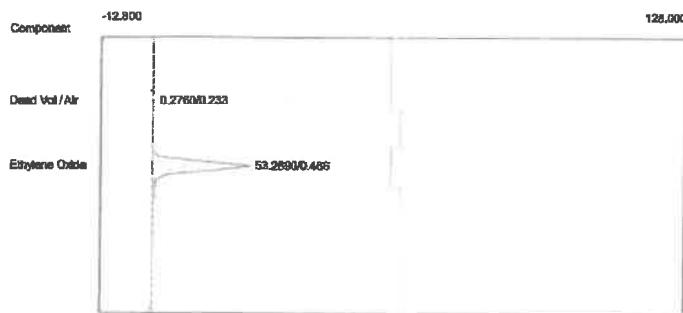
Lab name: ECSI
 Client: CR Bard - Covington, GA
 Client ID: PreCal
 Analysis date: 09/11/2019 12:51:18
 Method: Direct Injection
 Description: CHANNEL 2 - PID
 Column: 1% SP-1000, CarboPack B
 Carrier: HELIUM
 Temp. prog: eto-100.term
 Components: eto2-100.cpt
 Data file: 2CRBardCov2019-Amb.CHR (c:\peak359)
 Sample: Ambient Background
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1580	0.0000	
Ambient H ₂ O	0.316	0.3430	0.0000	
		2.5010	0.0000	

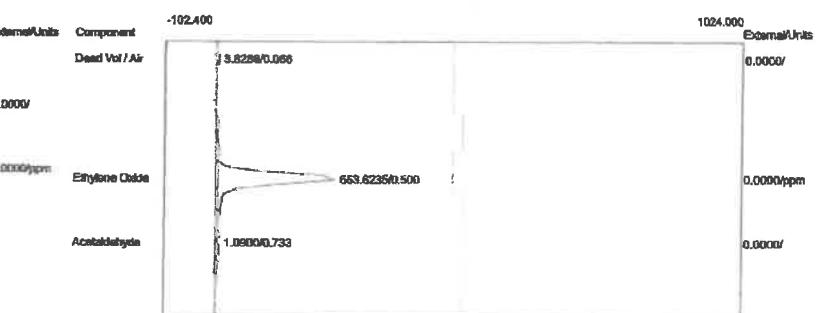
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	158.0040	0.0000	
Ambient H ₂ O	0.366	746.1140	0.0000	
		904.1180	0.0000	

Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 12:59:30
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-C01.CHR (c:\peak359)
Sample: 100 ppm std
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.2760	0.0000	
Ethylene Oxide	0.466	53.2890	0.0000	ppm
		53.5650	0.0000	

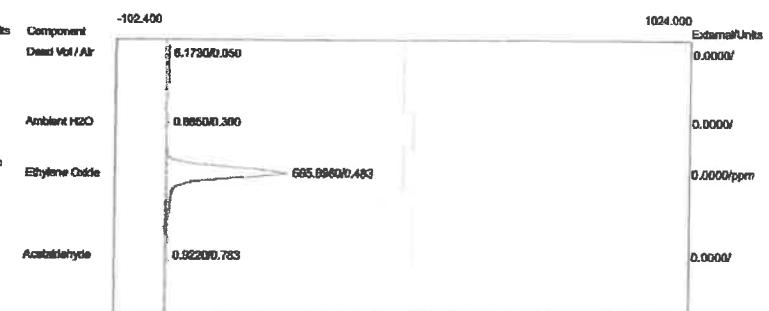
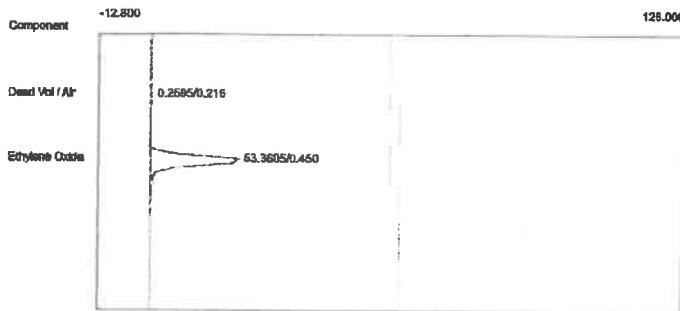
Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 12:59:30
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-C01.CHR (c:\peak359)
Sample: 100 ppm std
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.066	3.8280	0.0000	
Ethylene Oxide	0.500	663.6235	0.0000	ppm
Acetaldehyde	0.733	1.0900	0.0000	
		668.5415	0.0000	

Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 13:02:21
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-C02.CHR (c:\peak359)
Sample: 100 ppm std
Operator: D. Kremer

Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 13:02:21
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-C02.CHR (c:\peak359)
Sample: 100 ppm std
Operator: D. Kremer

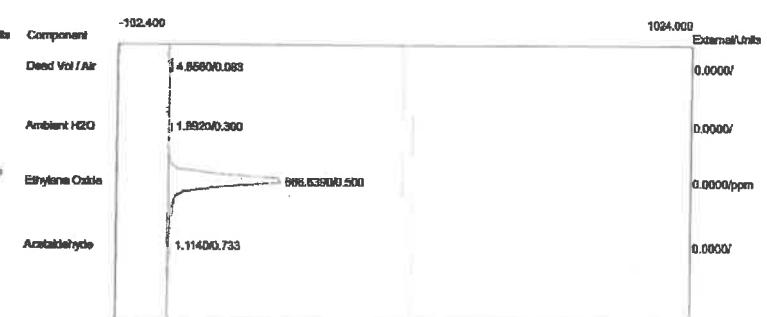
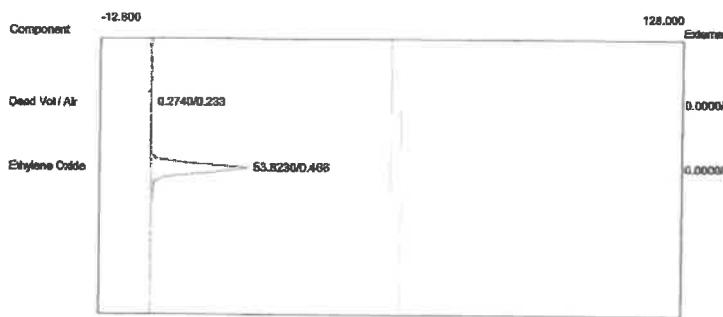


Component	Retention	Area	External	Units
Dead Vol / Air	0.216	0.2595	0.0000	
Ethylene Oxide	0.450	53.3605	0.0000	ppm
		53.6200	0.0000	

Component	Retention	Area	External	Units
Dead Vol / Air	0.050	6.1730	0.0000	
Ambient H2O	0.300	0.8850	0.0000	
Ethylene Oxide	0.483	665.8960	0.0000	ppm
Acetaldehyde	0.783	0.9220	0.0000	
		673.8760	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 13:04:42
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-C03.CHR (c:\peak359)
Sample: 100 ppm std
Operator: D. Kremer

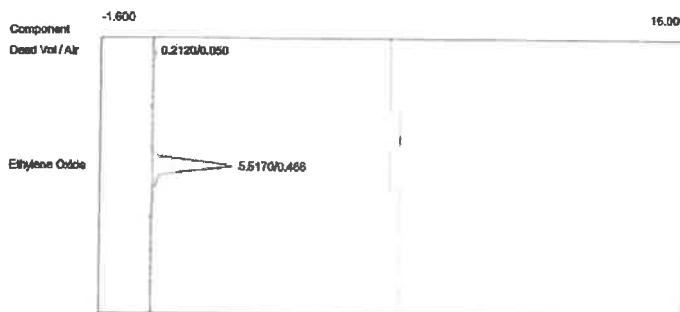
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 13:04:42
Method: Direct injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-C03.CHR (c:\peak359)
Sample: 100 ppm std
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.2740	0.0000	
Ethylene Oxide	0.466	53.8230	0.0000	ppm
		54.0970	0.0000	

Component	Retention	Area	External	Units
Dead Vol / Air	0.083	4.8580	0.0000	
Ambient H2O	0.300	1.8920	0.0000	
Ethylene Oxide	0.500	666.6390	0.0000	ppm
Acetaldehyde	0.733	1.1140	0.0000	
		674.5030	0.0000	

Lab name: ECSi
 Client: CR Bard - Covington, GA
 Client ID: PreCal
 Analysis date: 09/11/2019 13:09:38
 Method: Direct Injection
 Description: CHANNEL 1 - FID
 Column: 1% SP-1000, Carbopack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto1-100.cpt
 Data file: 1CRBardCov2019-C04.CHR (c:\peak359)
 Sample: 10.2 ppm std
 Operator: D. Kremer



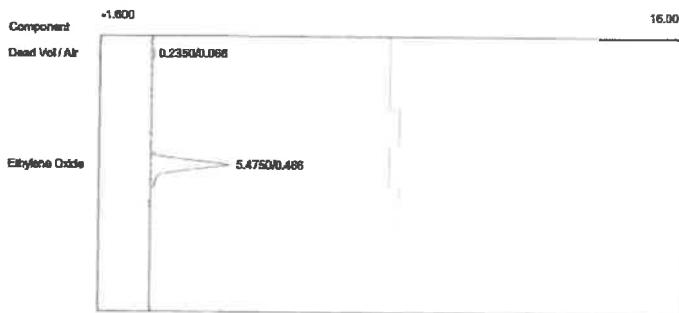
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	0.2120	0.0000	
Ethylene Oxide	0.466	5.5170	0.0000	ppm
		5.7290	0.0000	

Lab name: ECSi
 Client: CR Bard - Covington, GA
 Client ID: PreCal
 Analysis date: 09/11/2019 13:09:38
 Method: Direct Injection
 Description: CHANNEL 2 - PID
 Column: 1% SP-1000, Carbopack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto2-100.cpt
 Data file: 2CRBardCov2019-C04.CHR (c:\peak359)
 Sample: 10.2 ppm std
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.083	9.7370	0.0000	
Ethylene Oxide	0.483	67.4940	0.0000	ppm
Acetaldehyde	0.750	0.7980	0.0000	
		78.0290	0.0000	

Lab name: ECSI
 Client: CR Bard - Covington, GA
 Client ID: PreCal
 Analysis date: 09/11/2019 13:13:19
 Method: Direct Injection
 Description: CHANNEL 1 - FID
 Column: 1% SP-1000, CarboPack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto1-100.cpt
 Data file: 1CRBardCov2019-C05.CHR (c:\peak359)
 Sample: 10.2 ppm std
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.066	0.2350	0.0000	
Ethylene Oxide	0.466	5.4750	0.0000	ppm
		5.7100	0.0000	

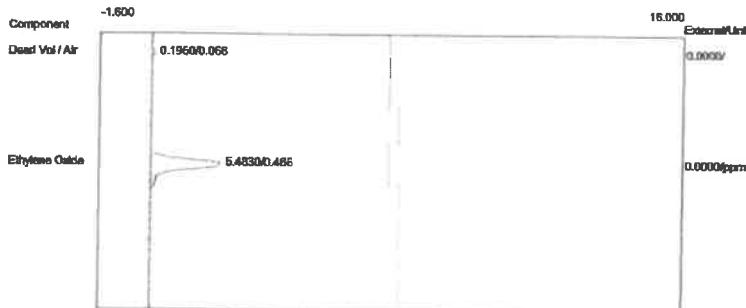
Lab name: ECSI
 Client: CR Bard - Covington, GA
 Client ID: PreCal
 Analysis date: 09/11/2019 13:13:19
 Method: Direct Injection
 Description: CHANNEL 2 - PID
 Column: 1% SP-1000, CarboPack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto2-100.cpt
 Data file: 2CRBardCov2019-C05.CHR (c:\peak359)
 Sample: 10.2 ppm std
 Operator: D. Kremer



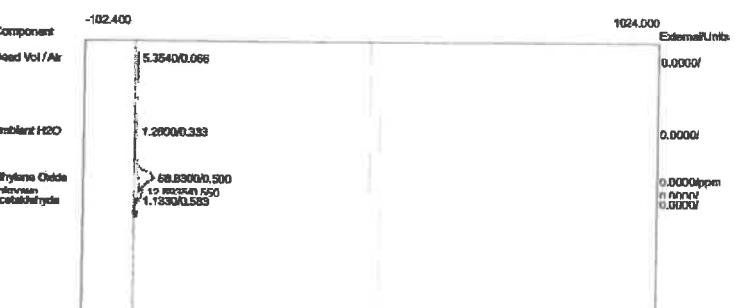
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	12.0085	0.0000	
Ethylene Oxide	0.483	66.7910	0.0000	ppm
Acetaldehyde	0.850	1.2120	0.0000	
		80.0115	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 13:17:50
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-C06.CHR (c:\peak359)
Sample: 10.2 ppm std
Operator: D. Kremer

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 13:17:50
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-C06.CHR (c:\peak359)
Sample: 10.2 ppm std
Operator: D. Kremer



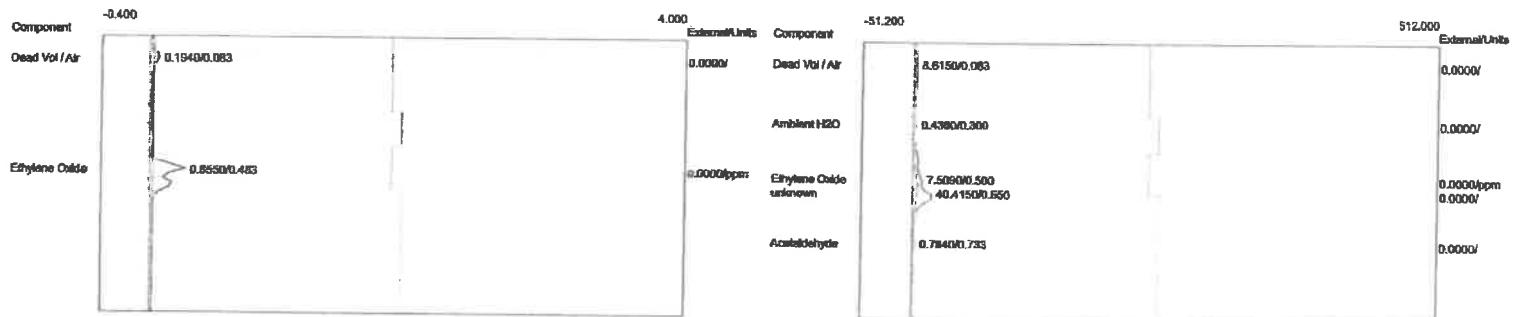
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	0.1950	0.0000	
Ethylene Oxide	0.466	5.4830	0.0000	ppm
		5.6780	0.0000	



Component	Retention	Area	External	Units
Dead Vol / Air	0.066	5.3540	0.0000	
Ambient H2O	0.333	1.2600	0.0000	
Ethylene Oxide	0.500	68.8300	0.0000	ppm
Acetaldehyde	0.583	1.1330	0.0000	
		76.5770	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 13:23:10
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-C07.CHR (c:\peak359)
Sample: 1.18 ppm std
Operator: D. Kremer

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 13:23:10
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-C07.CHR (c:\peak359)
Sample: 1.18 ppm std
Operator: D. Kremer

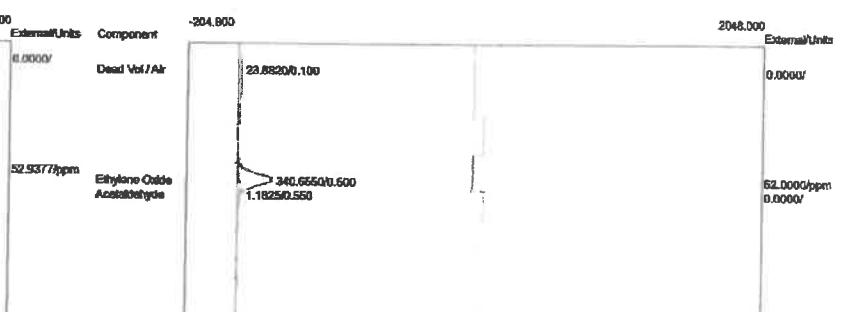
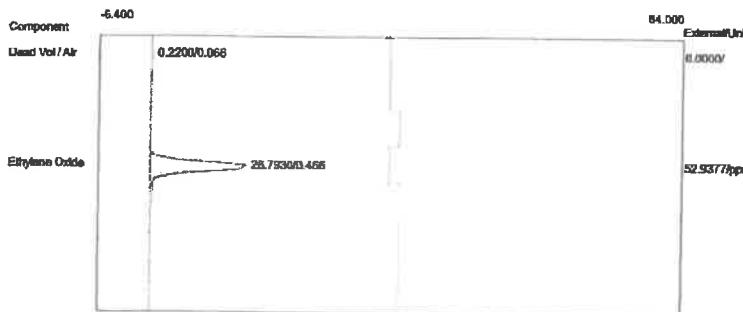


Component	Retention	Area	External	Units
Dead Vol / Air	0.083	0.1940	0.0000	
Ethylene Oxide	0.483	0.6550	0.0000	ppm
		0.8490	0.0000	

Component	Retention	Area	External	Units
Dead Vol / Air	0.083	8.6150	0.0000	
Ambient H2O	0.300	0.4360	0.0000	
Ethylene Oxide	0.500	7.5090	0.0000	ppm
Acetaldehyde	0.733	0.7840	0.0000	
		17.3540	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 13:53:43
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-C10.CHR (c:\peak359)
Sample: 52.0 ppm std
Operator: D. Kremer

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: PreCal
Analysis date: 09/11/2019 13:53:43
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-C10.CHR (c:\peak359)
Sample: 52.0 ppm std
Operator: D. Kremer

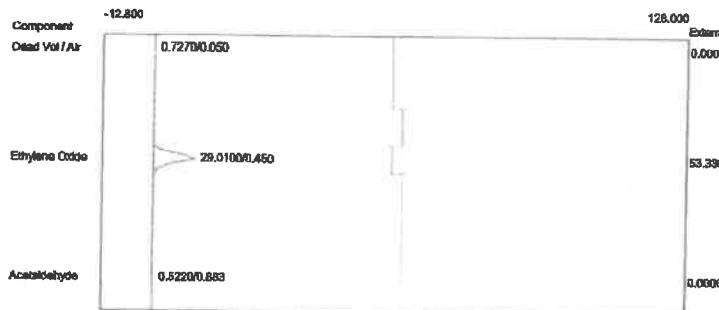


Component	Retention	Area	External	Units
Dead Vol / Air	0.066	0.2200	0.0000	
Ethylene Oxide	0.466	28.7930	52.9377 ppm	
	29.0130	52.9377		

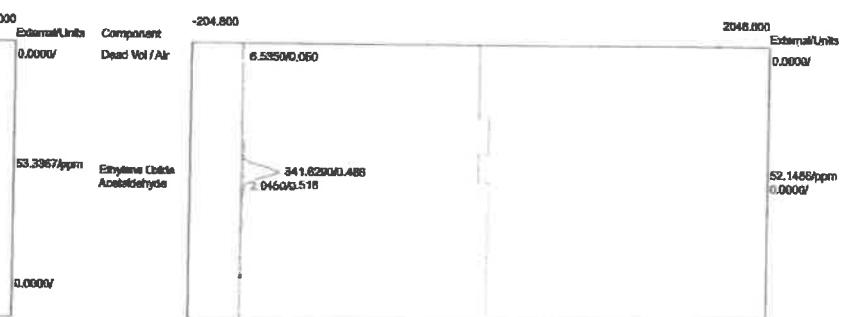
Component	Retention	Area	External	Units
Dead Vol / Air	0.100	23.8820	0.0000	
Ethylene Oxide	0.500	340.6550	52.0000 ppm	
Acetaldehyde	0.550	1.1825	0.0000	
	365.7195	52.0000		

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: MidPostCal
Analysis date: 09/11/2019 17:53:50
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: etc-100.tem
Components: etc1-100.cpt
Data file: 1CRBardCov2019-C11.CHR (c:\peak359)
Sample: 52.0 ppm std
Operator: D. Kremer

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: MidPostCal
Analysis date: 09/11/2019 17:53:50
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: etc-100.tem
Components: etc2-100.cpt
Data file: 2CRBardCov2019-C11.CHR (c:\peak359)
Sample: 52.0 ppm std
Operator: D. Kremer



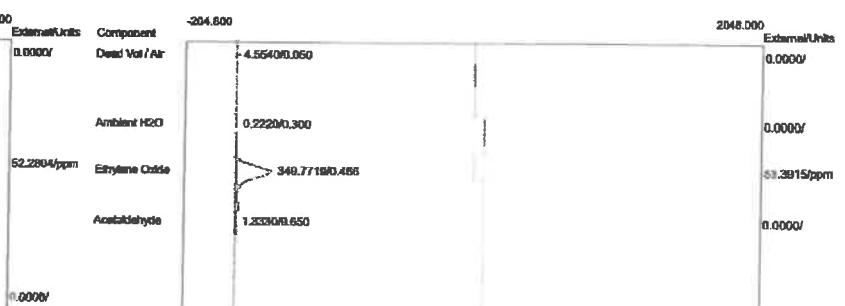
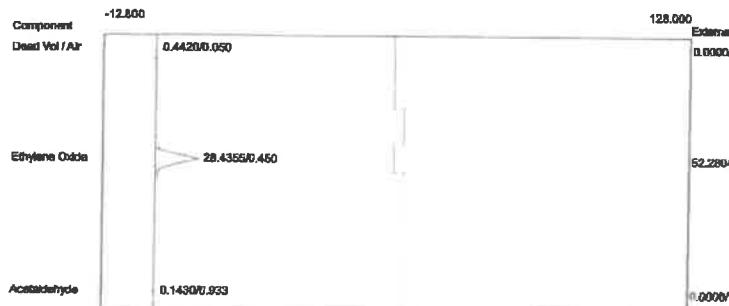
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	0.7270	0.0000	
Ethylene Oxide	0.450	29.0100	53.3367	ppm
Acetaldehyde	0.883	0.5220	0.0000	
	30.2590	53.3367		



Component	Retention	Area	External	Units
Dead Vol / Air	0.050	6.5350	0.0000	
Ethylene Oxide	0.466	341.6290	52.1486	ppm
Acetaldehyde	0.516	2.0450	0.0000	
	350.2090	52.1486		

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: MidPreCal
Analysis date: 09/12/2019 09:00:09
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-C12.CHR (c:\peak359)
Sample: 52.0 ppm std
Operator: D. Kremer

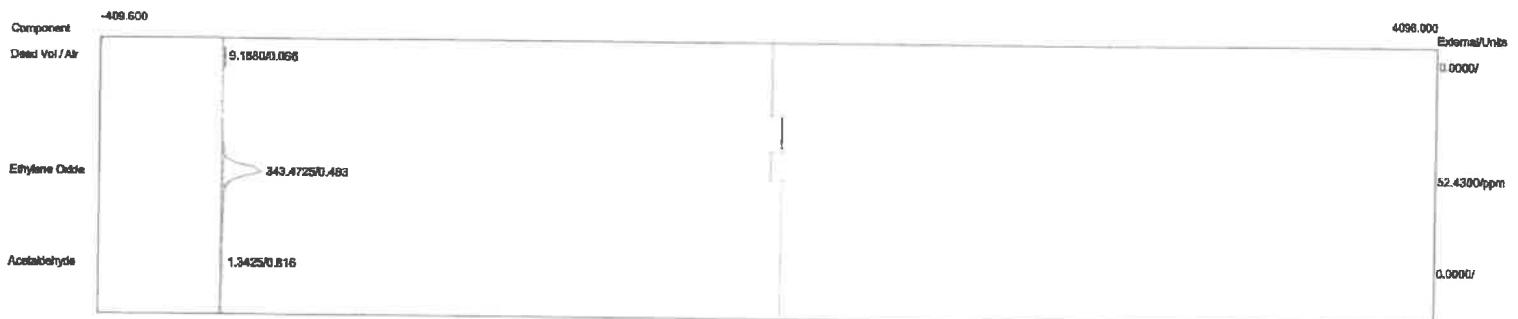
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: MidPreCal
Analysis date: 09/12/2019 09:00:09
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-C12.CHR (c:\peak359)
Sample: 52.0 ppm std
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.050	0.4420	0.0000	
Ethylene Oxide	0.450	28.4355	52.2804	ppm
Acetaldehyde	0.933	0.1430	0.0000	
	29.0205	52.2804		

Component	Retention	Area	External	Units
Dead Vol / Air	0.050	4.5540	0.0000	
Ambient H2O	0.300	0.2220	0.0000	
Ethylene Oxide	0.466	349.7710	53.3915	ppm
Acetaldehyde	0.650	1.3330	0.0000	
	355.8800	53.3915		

Lab name: ECSI
 Client: CR Bard - Covington, GA
 Client ID: PostCal
 Analysis date: 09/12/2019 12:15:35
 Method: Direct Injection
 Description: CHANNEL 2 - PID
 Column: 1% SP-1000, CarboPack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto2-100.cpt
 Data file: 2CRBardCov2019-C13.CHR (c:\peak359)
 Sample: 52.0 ppm std
 Operator: D. Kremer

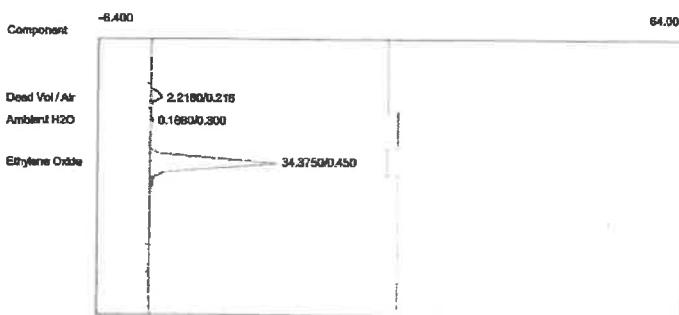


Component	Retention	Area	External	Units
Dead Vol / Air	0.066	9.1680	0.0000	
Ethylene Oxide	0.483	343.4725	52.4300	ppm
Acetaldehyde	0.816	1.3425	0.0000	
		353.9830	52.4300	

APPENDIX B

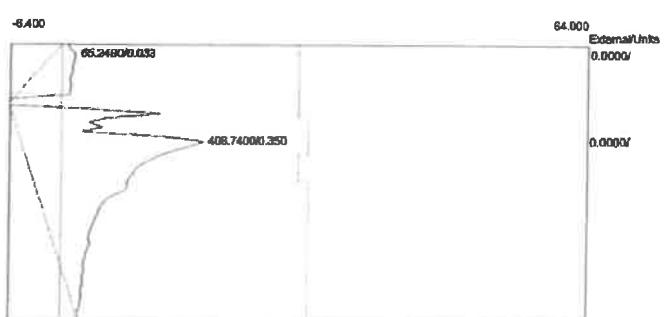
Run #1 Chromatograms – Aeration

Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 14:51:00
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-1A01.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



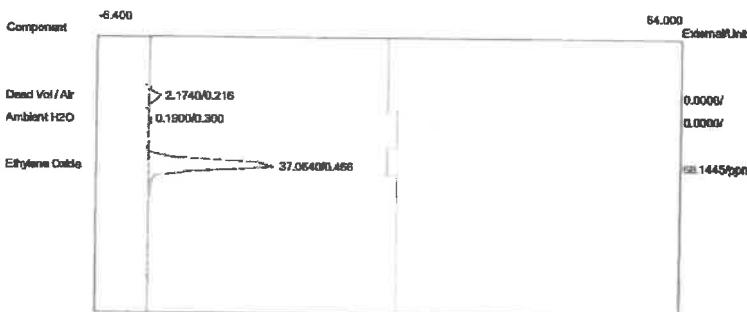
Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.2180	0.0000	
Ambient H2O	0.300	0.1880	0.0000	
Ethylene Oxide	0.450	34.3750	63.2006 ppm	
	36.7810	63.2006		

Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 14:51:00
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-1A01.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer

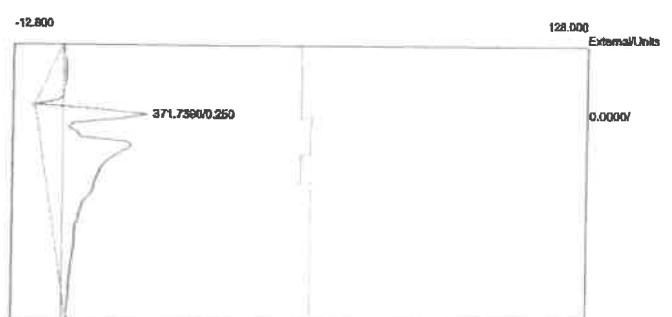


Component	Retention	Area	External	Units
Dead Vol / Air	0.033	65.2490	0.0000	
Ambient H2O	0.350	408.7400	0.0000	
	473.9890	0.0000		

Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 14:55:09
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-1A02.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



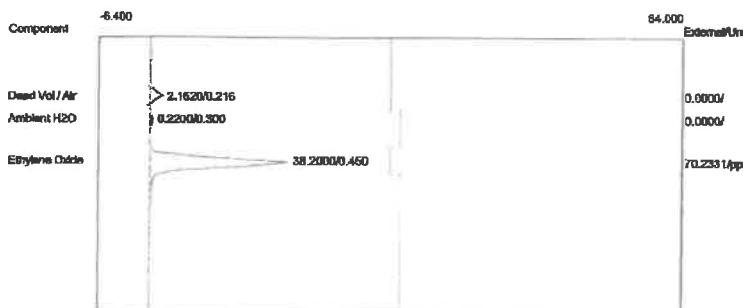
Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 14:55:09
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-1A02.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1740	0.0000	
Ambient H2O	0.300	0.1900	0.0000	
Ethylene Oxide	0.466	37.0640	68.1445 ppm	
		39.4280	68.1445	

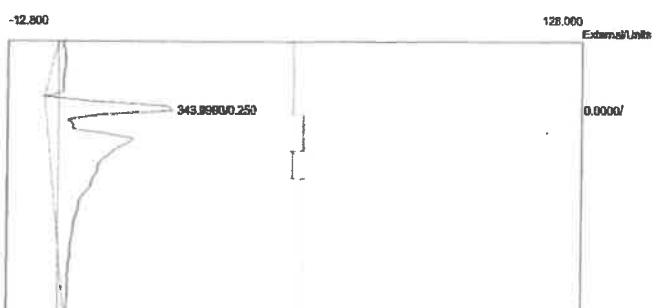
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	371.7390	0.0000	
		371.7390	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:00:40
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-1A03.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



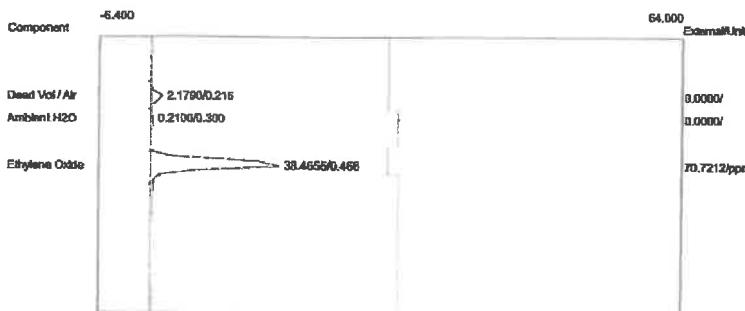
Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1620	0.0000	
Ambient H2O	0.300	0.2200	0.0000	
Ethylene Oxide	0.450	38.2000	70.2331	ppm
		40.5820	70.2331	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:00:40
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-1A03.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer

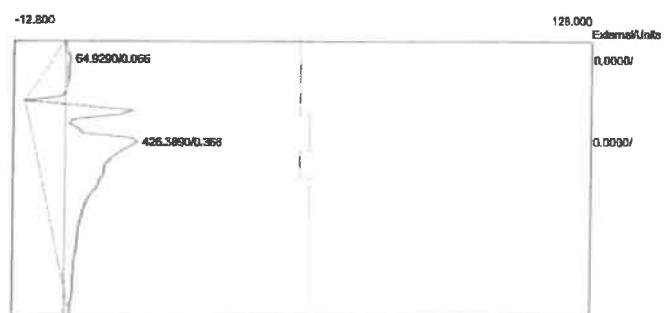


Component	Retention	Area	External	Units
Dead Vol / Air	0.250	343.9990	0.0000	
		343.9990	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:05:29
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-1A04.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



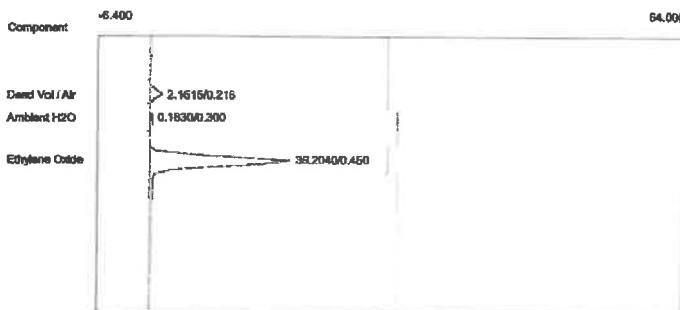
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:05:29
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-1A04.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1790	0.0000	
Ambient H2O	0.300	0.2100	0.0000	
Ethylene Oxide	0.466	38.4655	70.7212 ppm	
	40.8545	70.7212		

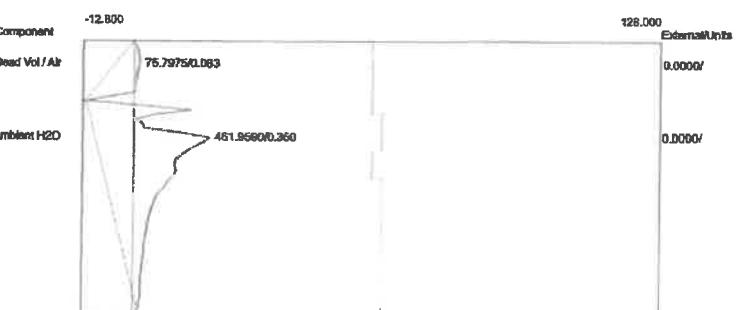
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	64.9290	0.0000	
Ambient H2O	0.366	426.3890	0.0000	
	491.3180	0.0000		

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:10:25
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-1A05.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1615	0.0000	
Ambient H2O	0.300	0.1830	0.0000	
Ethylene Oxide	0.450	39.2040	72.0790	ppm
		41.5485	72.0790	

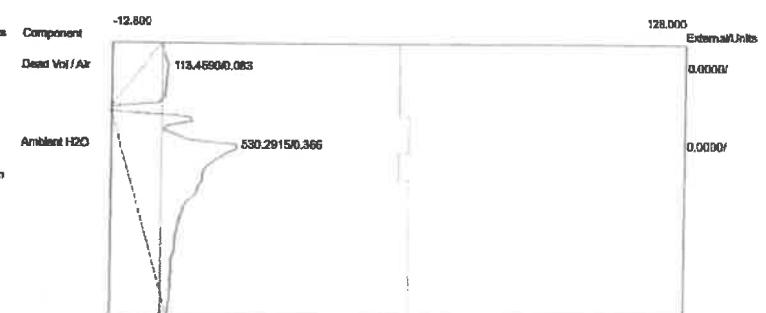
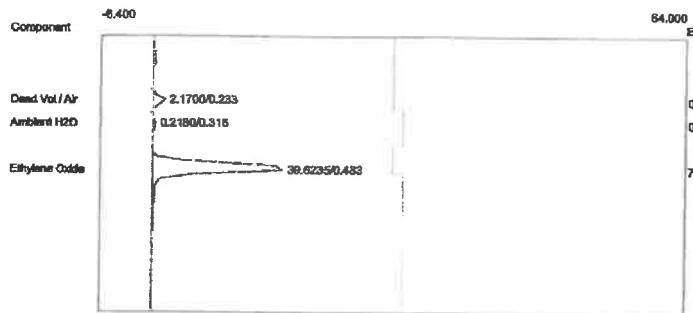
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:10:25
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-1A05.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.083	75.7975	0.0000	
Ambient H2O	0.350	461.9590	0.0000	
		537.7565	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:15:14
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-1A06.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer

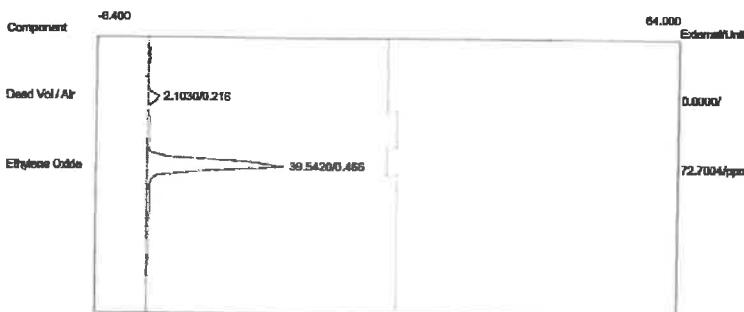
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:15:14
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-1A06.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1700	0.0000	
Ambient H ₂ O	0.316	0.2180	0.0000	
Ethylene Oxide	0.483	38.6235	72.8503 ppm.	
		42.0115	72.8503	

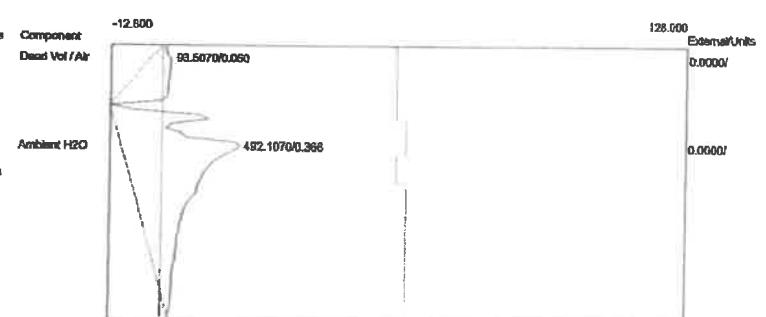
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	113.4590	0.0000	
Ambient H ₂ O	0.366	530.2915	0.0000	
		643.7505	0.0000	

Lab name: ECSI
 Client: CR Bard - Covington, GA
 Client ID: Run#1Aer
 Analysis date: 09/11/2019 15:20:17
 Method: Direct Injection
 Description: CHANNEL 1 - FID
 Column: 1% SP-1000, CarboPack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto1-100.cpt
 Data file: 1CRBardCov2019-1A07.CHR (c:\peak359)
 Sample: Oxidizer inlet
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1030	0.0000	
Ethylene Oxide	0.466	39.5420	72.7004	ppm
		41.6450	72.7004	

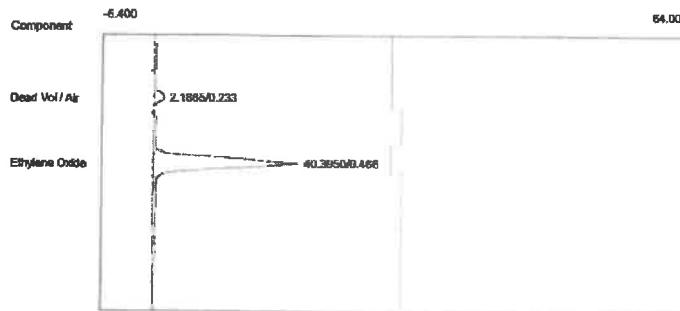
Lab name: ECSI
 Client: CR Bard - Covington, GA
 Client ID: Run#1Aer
 Analysis date: 09/11/2019 15:20:17
 Method: Direct Injection
 Description: CHANNEL 2 - PID
 Column: 1% SP-1000, CarboPack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto2-100.cpt
 Data file: 2CRBardCov2019-1A07.CHR (c:\peak359)
 Sample: Oxidizer Outlet
 Operator: D. Kremer



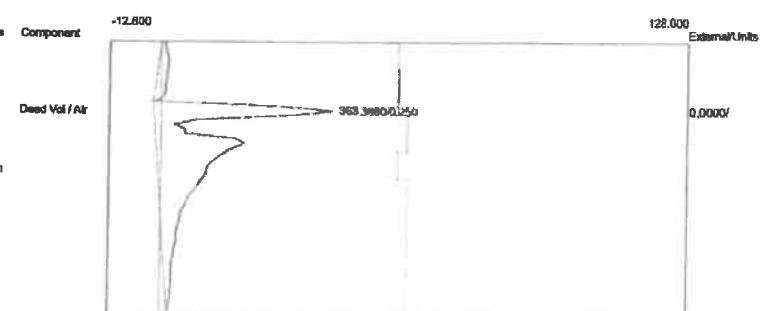
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	93.5070	0.0000	
Ambient H2O	0.366	492.1070	0.0000	
		585.6140	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:25:32
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-1A08.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:25:32
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-1A08.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



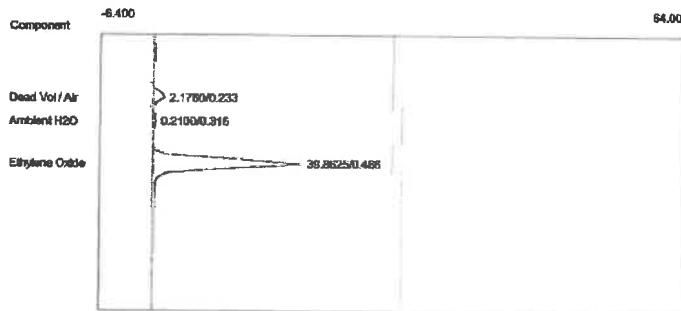
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1885	0.0000	
Ethylene Oxide	0.466	40.3950	74.2687 ppm	
		42.5835	74.2687	



Component	Retention	Area	External	Units
Dead Vol / Air	0.250	363.3880	0.0000	
		363.3880	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:30:08
Method: Direct Injection
Description: CHANNEL 1 - FID .
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-1A09.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer

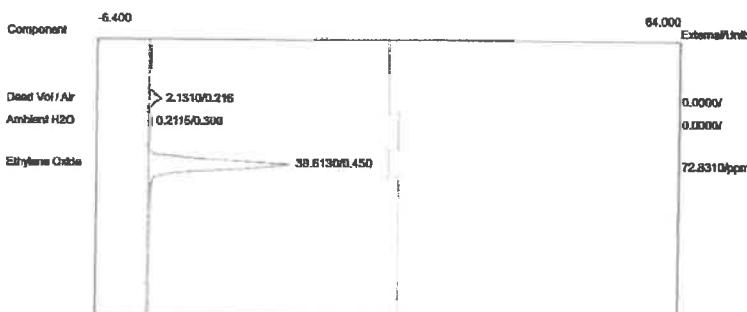
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:30:08
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-1A09.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



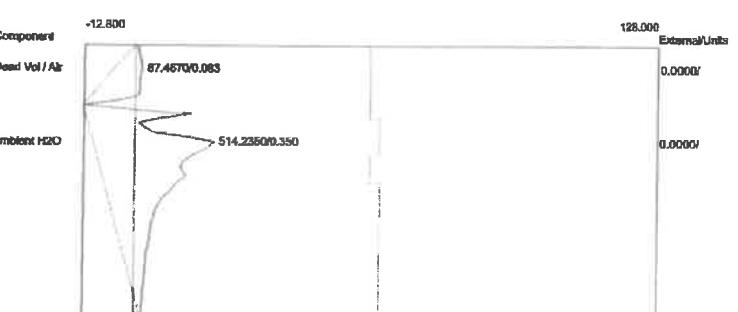
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1760	0.0000	
Ambient H2O	0.316	0.2100	0.0000	
Ethylene Oxide	0.466	39.8625	73.2897 ppm	
	42.2485	73.2897		

Component	Retention	Area	External	Units
Dead Vol / Air	0.266	404.4370	0.0000	
	404.4370	0.0000		

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:35:20
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tern
Components: eto1-100.cpt
Data file: 1CRBardCov2019-1A10.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



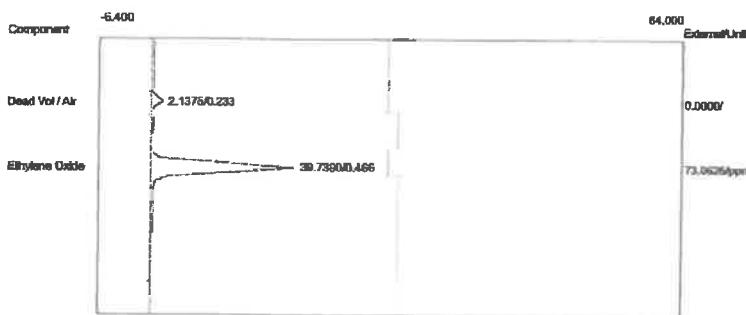
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:35:20
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tern
Components: eto2-100.cpt
Data file: 2CRBardCov2019-1A10.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1310	0.0000	
Ambient H2O	0.300	0.2115	0.0000	
Ethylene Oxide	0.450	39.6130	72.8310 ppm	
	41.9555	72.8310		

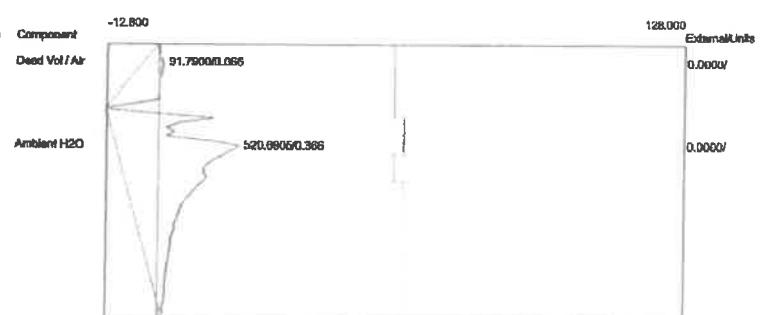
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	87.4670	0.0000	
Ambient H2O	0.350	514.2350	0.0000	
	601.7020		0.0000	

Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:40:59
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-1A11.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



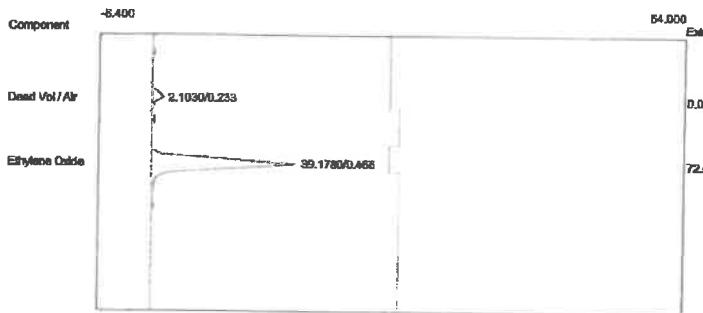
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1375	0.0000	
Ethylene Oxide	0.466	39.7390	73.0626 ppm	
		41.8765	73.0626	

Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: Run#1Aer
Analysis date: 09/11/2019 15:40:59
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-1A11.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer

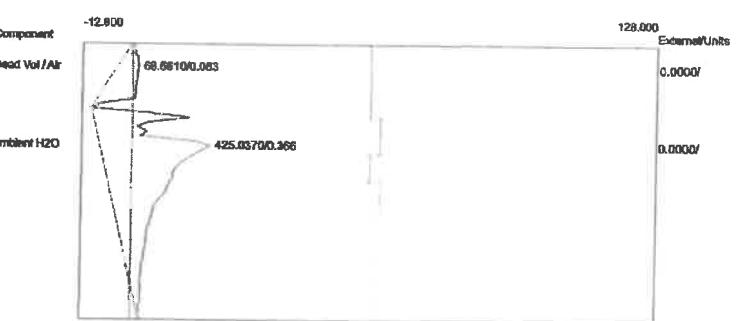


Component	Retention	Area	External	Units
Dead Vol / Air	0.066	91.7900	0.0000	
Ambient H2O	0.366	520.6905	0.0000	
		612.4805	0.0000	

Lab name: ECSI
 Client: CR Bard - Covington, GA
 Client ID: Run#1Aer
 Analysis date: 09/11/2019 15:45:13
 Method: Direct Injection
 Description: CHANNEL 1 - FID
 Column: 1% SP-1000, CarboPack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto1-100.cpt
 Data file: 1CRBardCov2019-1A12.CHR (c:\peak359)
 Sample: Oxidizer Inlet
 Operator: D. Kremer



Lab name: ECSI
 Client: CR Bard - Covington, GA
 Client ID: Run#1Aer
 Analysis date: 09/11/2019 15:45:13
 Method: Direct Injection
 Description: CHANNEL 2 - PID
 Column: 1% SP-1000, CarboPack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto2-100.cpt
 Data file: 2CRBardCov2019-1A12.CHR (c:\peak359)
 Sample: Oxidizer Outlet
 Operator: D. Kremer



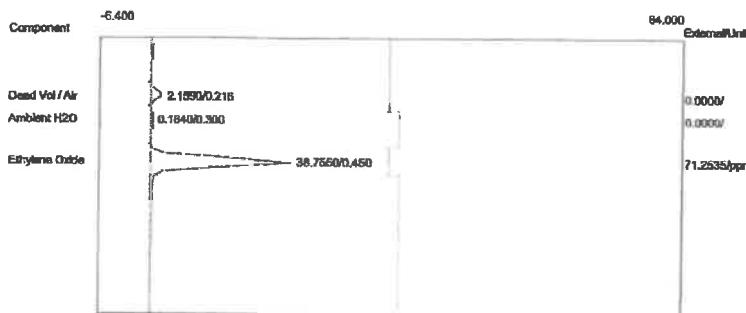
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1030	0.0000	
Ethylene Oxide	0.466	39.1780	72.0312	ppm
		41.2810	72.0312	

Component	Retention	Area	External	Units
Dead Vol / Air	0.083	68.6610	0.0000	
Ambient H2O	0.366	425.0370	0.0000	
		493.6980	0.0000	

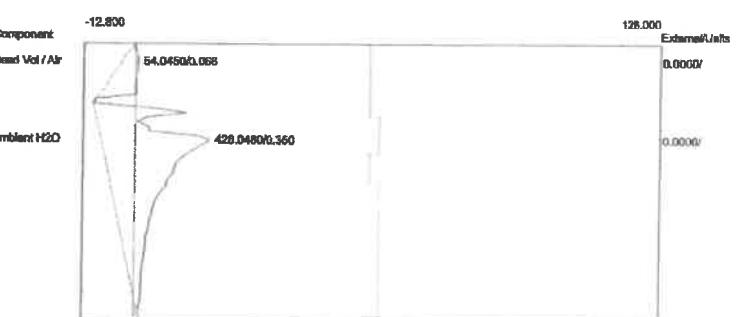
APPENDIX C

Run #2 Chromatograms – Aeration

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 15:50:05
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-2A01.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 15:50:05
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-2A01.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer

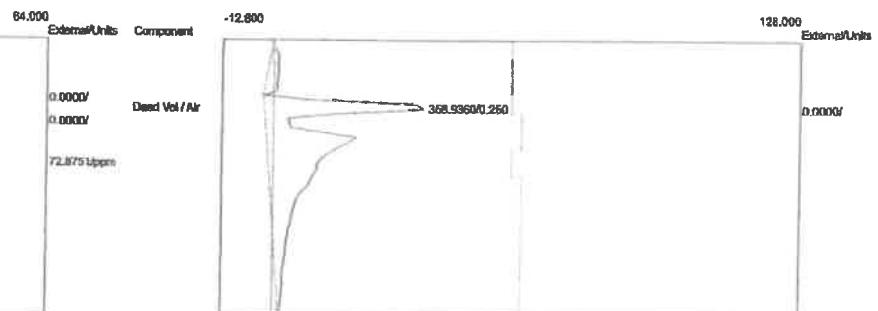
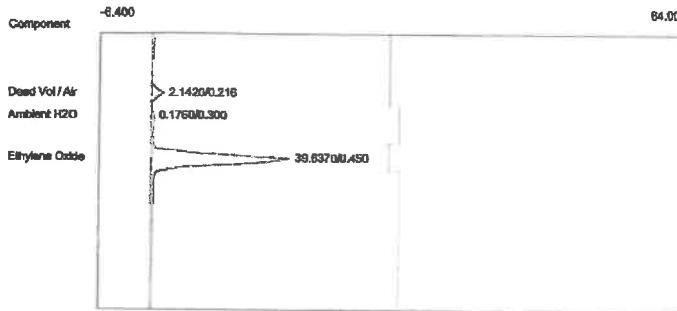


Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1590	0.0000	
Ambient H2O	0.300	0.1840	0.0000	
Ethylene Oxide	0.450	38.7550	71.2535 ppm	
		41.0980	71.2535	

Component	Retention	Area	External	Units
Dead Vol / Air	0.066	54.0450	0.0000	
Ambient H2O	0.350	428.0480	0.0000	
		482.0930	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 15:55:05
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-2A02.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer

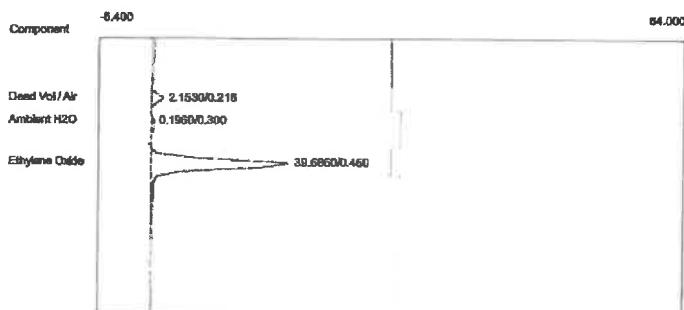
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 15:55:05
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-2A02.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1420	0.0000	
Ambient H2O	0.300	0.1760	0.0000	
Ethylene Oxide	0.450	39.6370	72.8751	ppm
		41.9550	72.8751	

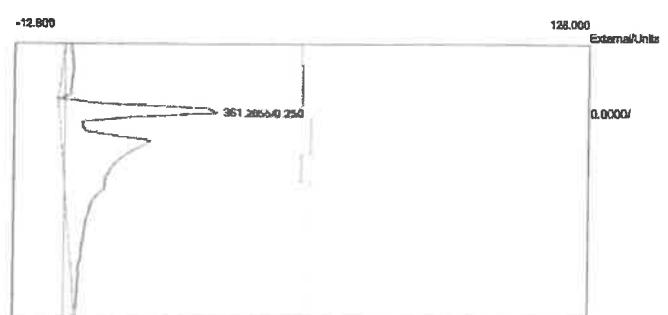
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	358.9360	0.0000	
		358.9360	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:00:47
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-2A03.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1530	0.0000	
Ambient H2O	0.300	0.1960	0.0000	
Ethylene Oxide	0.450	39.6660	72.9284 ppm	
	42.0150	72.9284		

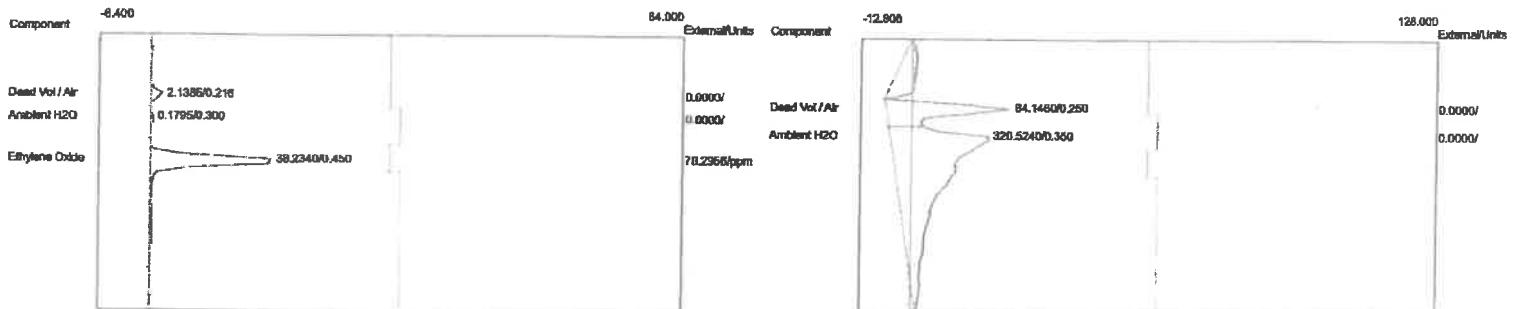
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:00:47
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-2A03.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.250	361.2055	0.0000	
	361.2055	0.0000		

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:05:40
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-2A04.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer

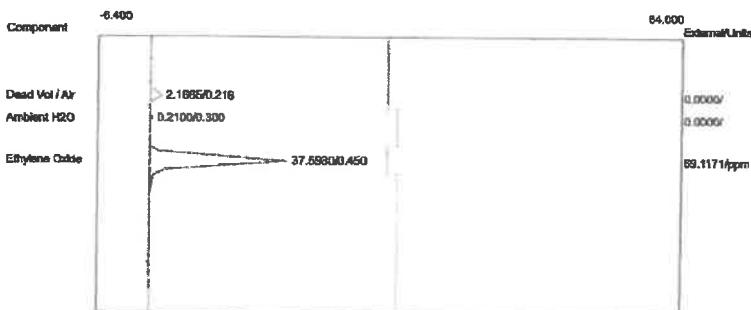
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:05:40
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-2A04.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1385	0.0000	
Ambient H2O	0.300	0.1795	0.0000	
Ethylene Oxide	0.450	38.2340	70.2956	ppm
	40.5520	70.2956		

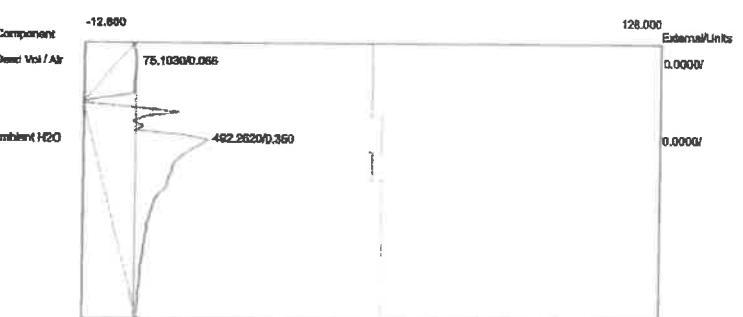
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	84.1460	0.0000	
Ambient H2O	0.350	320.5240	0.0000	
	404.6700	0.0000		

Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:10:25
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-2A05.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



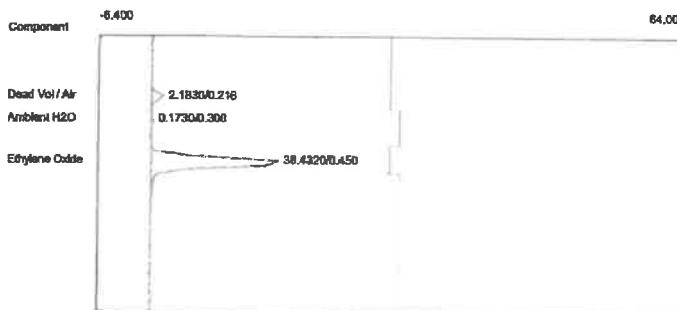
Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1665	0.0000	
Ambient H2O	0.300	0.2100	0.0000	
Ethylene Oxide	0.450	37.5930	69.1171 ppm	

Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:10:25
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-2A05.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer

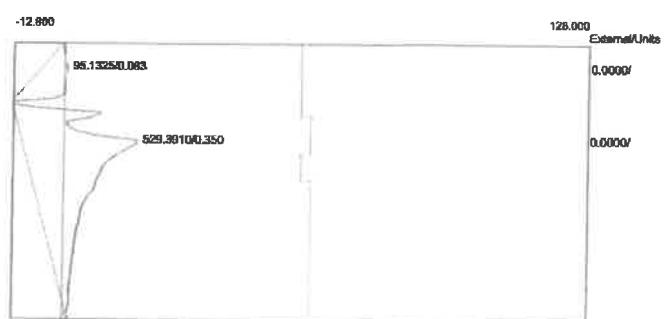


Component	Retention	Area	External	Units
Dead Vol / Air	0.066	75.1030	0.0000	
Ambient H2O	0.350	492.2620	0.0000	
			567.3650	0.0000

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:15:07
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-2A06.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



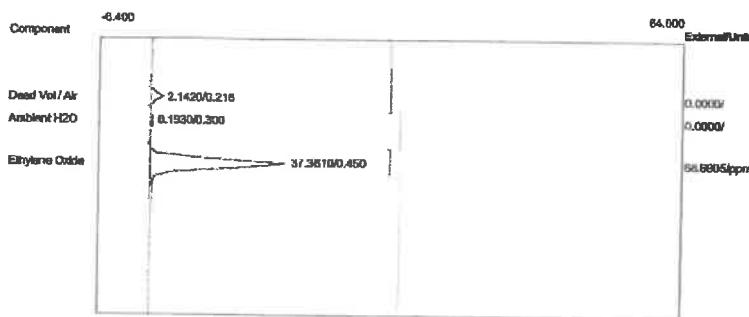
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:15:07
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-2A06.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1830	0.0000	
Ambient H2O	0.300	0.1730	0.0000	
Ethylene Oxide	0.450	38.4320	70.6596 ppm	
		40.7880	70.6596	

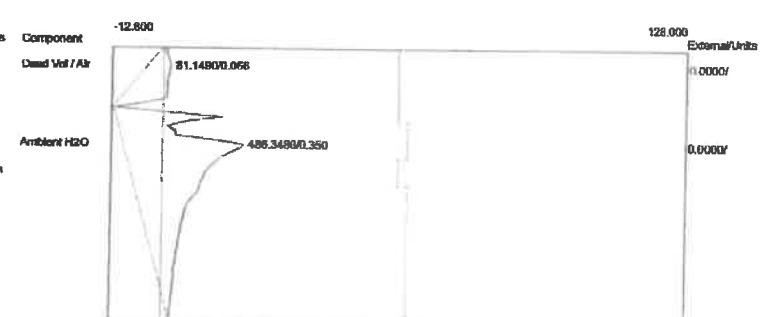
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	95.1325	0.0000	
Ambient H2O	0.350	529.3910	0.0000	
		624.5235	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:20:20
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-2A07.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



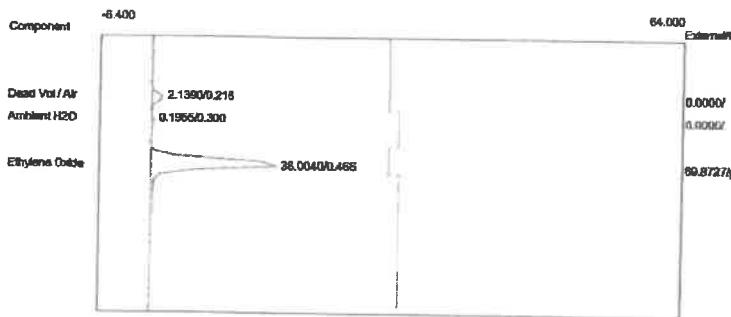
Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1420	0.0000	
Ambient H2O	0.300	0.1930	0.0000	
Ethylene Oxide	0.450	37.3610	68.6905 ppm	
		39.6960	68.6905	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:20:20
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-2A07.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer

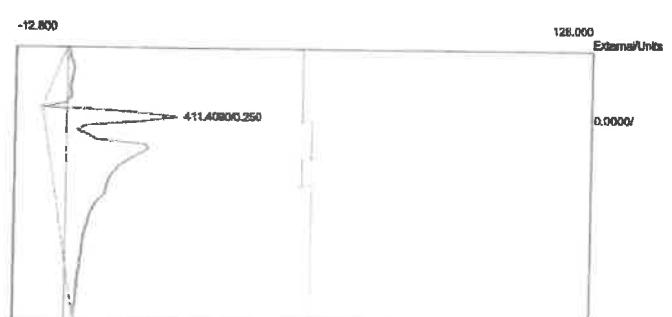


Component	Retention	Area	External	Units
Dead Vol / Air	0.066	81.1490	0.0000	
Ambient H2O	0.350	486.3480	0.0000	
		567.4970	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:25:25
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-2A08.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



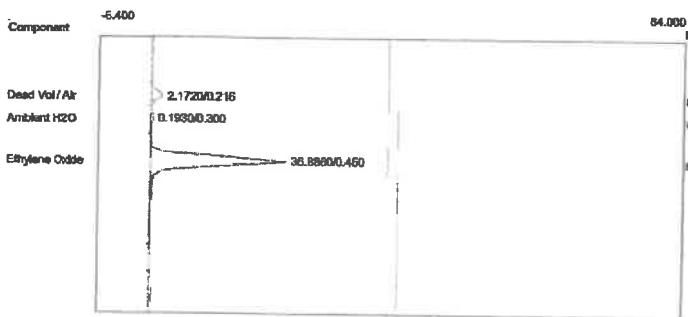
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:25:25
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-2A08.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1390	0.0000	
Ambient H ₂ O	0.300	0.1955	0.0000	
Ethylene Oxide	0.466	38.0040	69.8727 ppm	
		40.3385	69.8727	

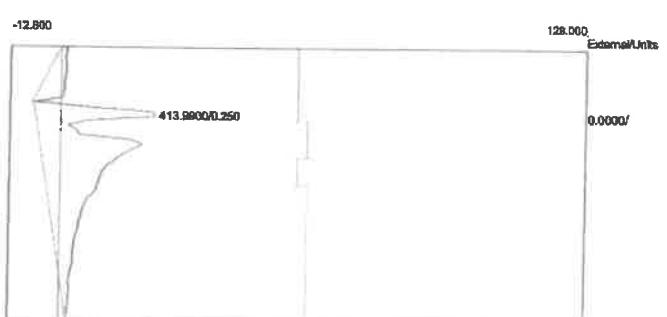
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	411.4090	0.0000	
		411.4090	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:30:05
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-2A09.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



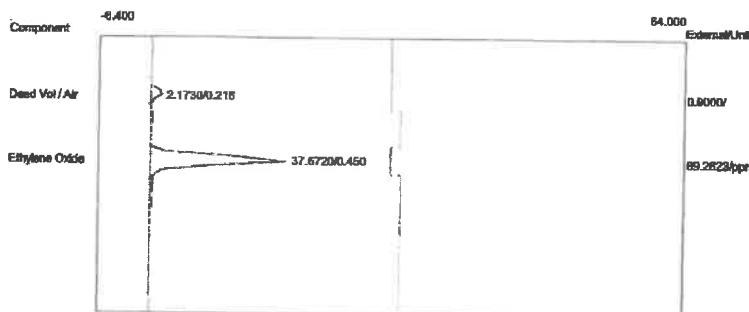
Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1720	0.0000	
Ambient H2O	0.300	0.1930	0.0000	
Ethylene Oxide	0.450	36.8860	67.8172 ppm	
		39.2510	67.8172	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:30:05
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.term
Components: eto2-100.cpt
Data file: 2CRBardCov2019-2A09.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



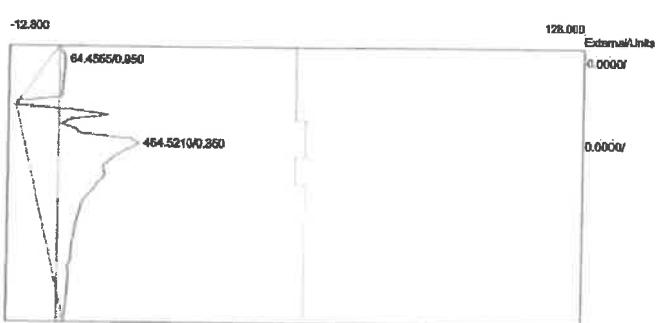
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	413.9900	0.0000	
		413.9900	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:35:15
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: etc-100.tem
Components: etc1-100.cpt
Data file: 1CRBardCov2019-2A10.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



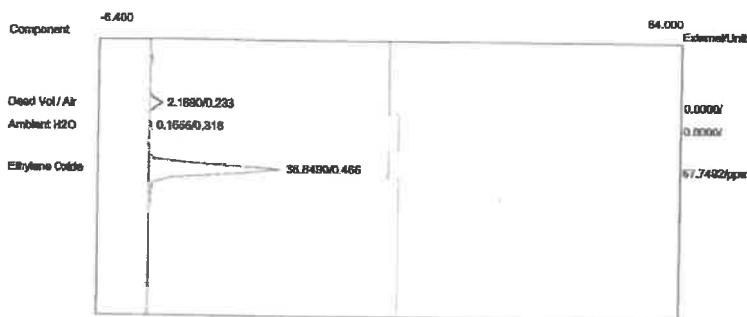
Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1730	0.0000	
Ethylene Oxide	0.450	37.6720	69.2623 ppm	
		39.8450	69.2623	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:35:15
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: etc-100.tem
Components: etc2-100.cpt
Data file: 2CRBardCov2019-2A10.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer

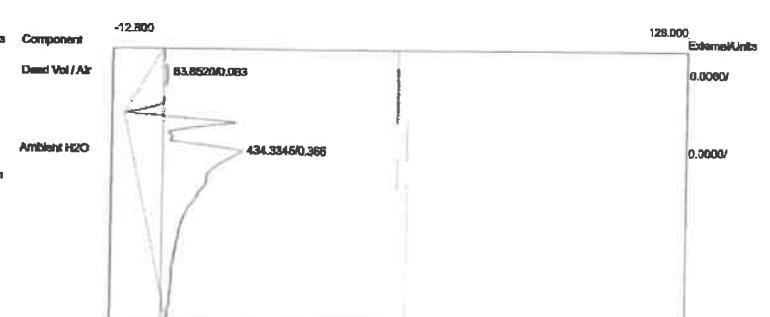


Component	Retention	Area	External	Units
Dead Vol / Air	0.050	64.4555	0.0000	
Ambient H2O	0.350	464.5210	0.0000	
		528.9765	0.0000	

Lab name: ECSi
Client: CR Baird - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:41:04
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-2A11.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



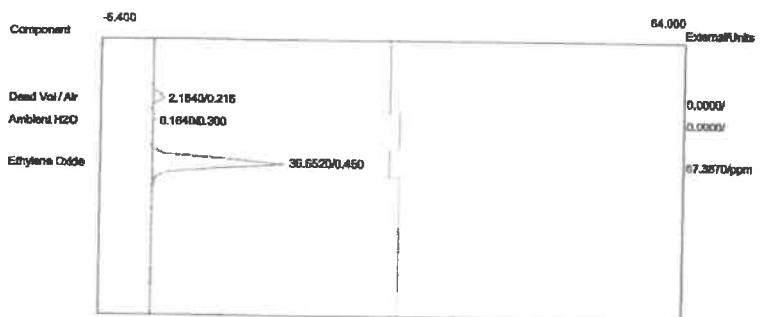
Lab name: ECSi
Client: CR Baird - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:41:04
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-2A11.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1690	0.0000	
Ambient H2O	0.316	0.1655	0.0000	
Ethylene Oxide	0.466	36.8490	67.7492 ppm	
	39.1835	67.7492		

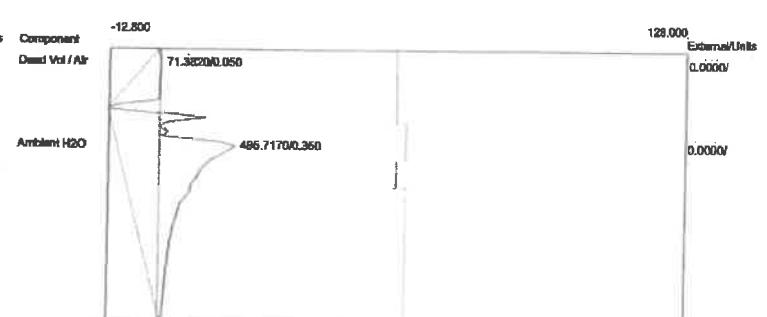
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	63.8520	0.0000	
Ambient H2O	0.366	434.3345	0.0000	
	498.1865	0.0000		

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:45:10
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-2A12.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1640	0.0000	
Ambient H ₂ O	0.300	0.1640	0.0000	
Ethylene Oxide	0.450	36.6520	67.3870	ppm
		38.9800	67.3870	

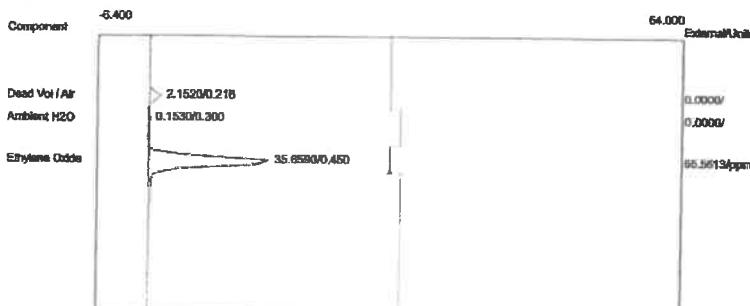
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#2Aer
Analysis date: 09/11/2019 16:45:10
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-2A12.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



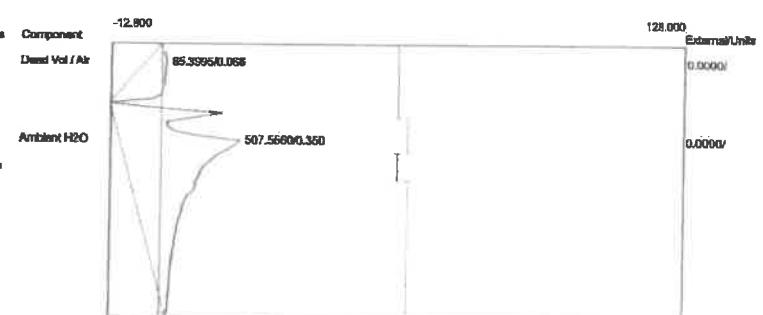
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	71.3820	0.0000	
Ambient H ₂ O	0.350	495.7170	0.0000	
		567.0990	0.0000	

APPENDIX D
Run #3 Chromatograms – Aeration

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 16:50:12
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.term
Components: eto1-100.cpt
Data file: 1CRBardCov2019-3A01.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



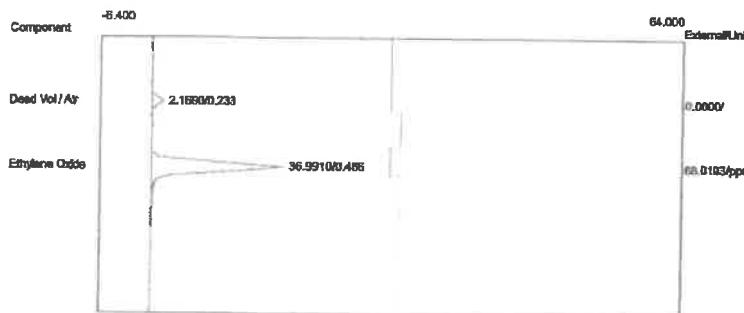
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 16:50:12
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.term
Components: eto2-100.cpt
Data file: 2CRBardCov2019-3A01.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1520	0.0000	
Ambient H2O	0.300	0.1530	0.0000	
Ethylene Oxide	0.450	35.6590	65.5613 ppm	
		37.9640	65.5613	

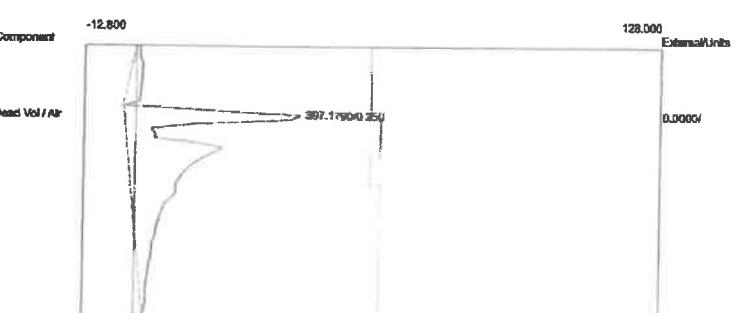
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	85.3995	0.0000	
Ambient H2O	0.350	507.5560	0.0000	
		592.9555	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 16:55:03
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbpak B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-3A02.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



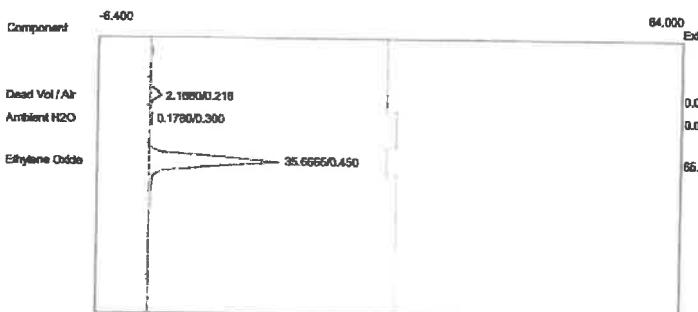
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1690	0.0000	
Ethylene Oxide	0.466	36.9910	68.0103	ppm
		39.1600	68.0103	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 16:55:03
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbpak B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-3A02.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer

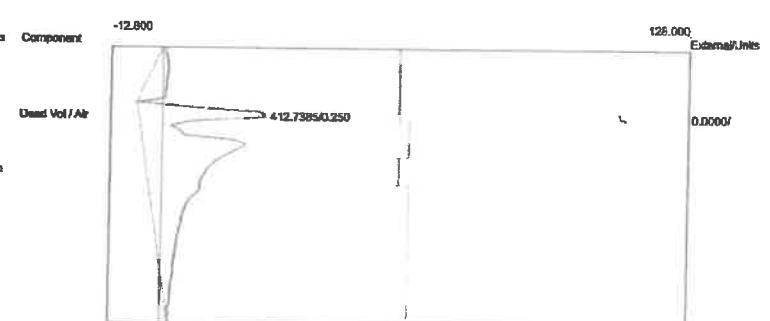


Component	Retention	Area	External	Units
Dead Vol / Air	0.250	397.1790	0.0000	
		397.1790	0.0000	

Lab name: ECSi
Client: CR Baird - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:00:19
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-3A03.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



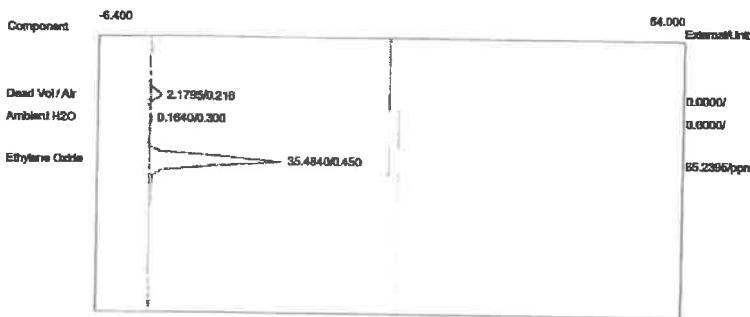
Lab name: ECSi
Client: CR Baird - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:00:19
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-3A03.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



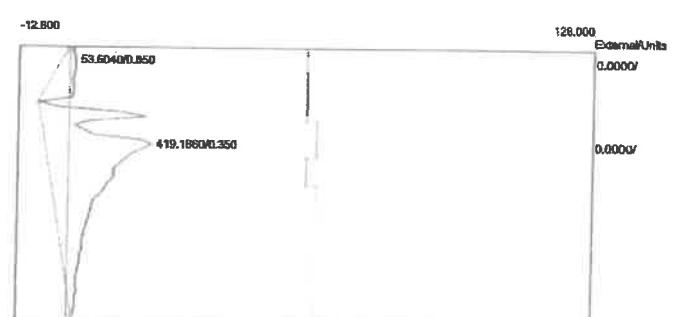
Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1660	0.0000	
Ambient H2O	0.300	0.1780	0.0000	
Ethylene Oxide	0.450	35.6665	65.5751	ppm
		38.0105	65.5751	

Component	Retention	Area	External	Units
Dead Vol / Air	0.250	412.7385	0.0000	
		412.7385	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:05:05
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-3A04.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



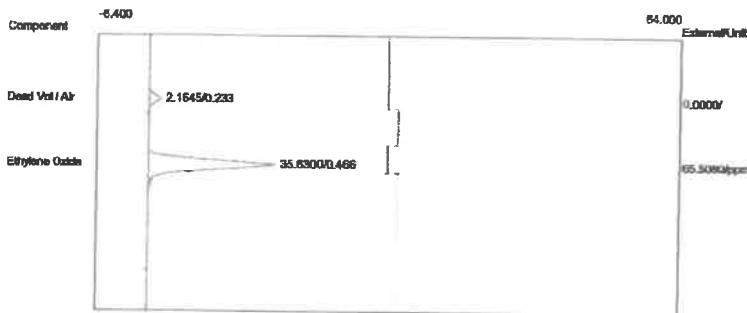
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:05:05
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-3A04.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1795	0.0000	
Ambient H2O	0.300	0.1640	0.0000	
Ethylene Oxide	0.450	35.4840	65.2395 ppm	
	37.8275	65.2395		

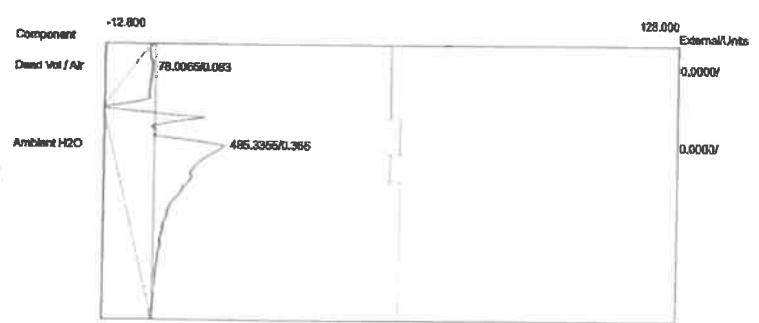
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	53.6040	0.0000	
Ambient H2O	0.350	419.1860	0.0000	
		472.7900	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:10:42
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-3A05.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



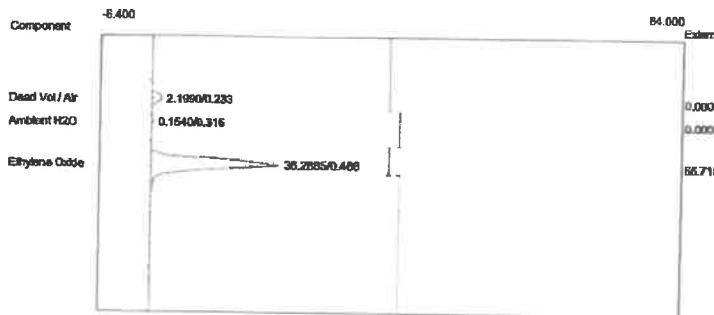
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1645	0.0000	
Ethylene Oxide	0.466	35.6300	65.5080 ppm	
		37.7945	65.5080	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:10:42
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-3A05.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



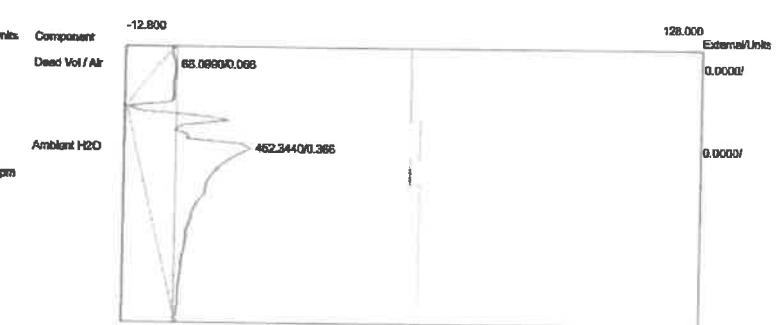
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	78.0065	0.0000	
Ambient H2O	0.366	485.3355	0.0000	
		563.3420	0.0000	

Lab name: ECSi
 Client: CR Bard - Covington, GA
 Client ID: Run#3Aer
 Analysis date: 09/11/2019 17:15:25
 Method: Direct Injection
 Description: CHANNEL 1 - FID
 Column: 1% SP-1000, Carbopack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto1-100.cpt
 Data file: 1CRBardCov2019-3A06.CHR (c:\peak359)
 Sample: Oxidizer Inlet
 Operator: D. Kremer



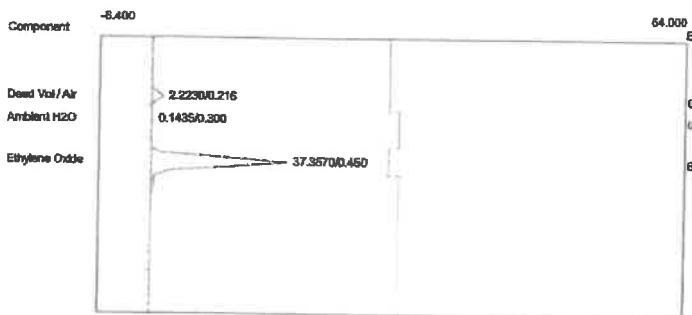
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1990	0.0000	
Ambient H2O	0.316	0.1540	0.0000	
Ethylene Oxide	0.466	36.2885	66.7187 ppm	
	38.6415	38.6415	66.7187	

Lab name: ECSi
 Client: CR Bard - Covington, GA
 Client ID: Run#3Aer
 Analysis date: 09/11/2019 17:15:25
 Method: Direct Injection
 Description: CHANNEL 2 - PID
 Column: 1% SP-1000, Carbopack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto2-100.cpt
 Data file: 2CRBardCov2019-3A06.CHR (c:\peak359)
 Sample: Oxidizer Outlet
 Operator: D. Kremer

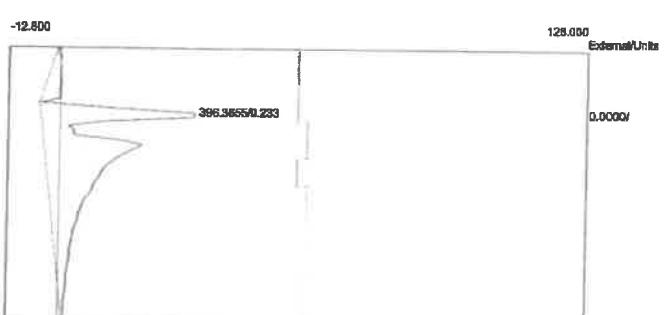


Component	Retention	Area	External	Units
Dead Vol / Air	0.066	68.0990	0.0000	
Ambient H2O	0.366	452.3440	0.0000	
		520.4430	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:20:05
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-3A07.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



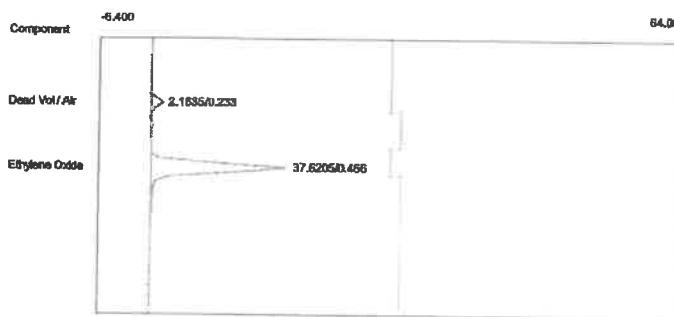
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:20:05
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-3A07.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.2230	0.0000	
Ambient H2O	0.300	0.1435	0.0000	
Ethylene Oxide	0.450	37.3570	68.6832 ppm	
	39.7235	39.7235	68.6832	

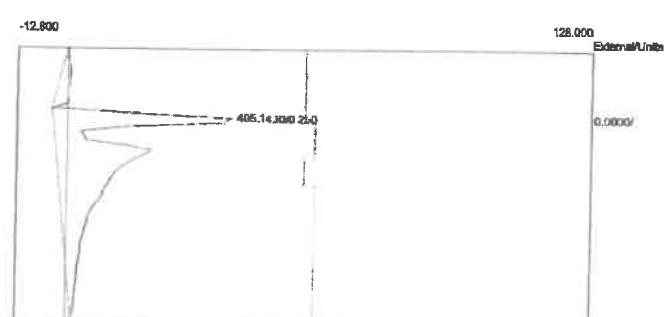
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	396.3655	0.0000	
	396.3655	396.3655	0.0000	

Lab name: ECSi
 Client: CR Bard - Covington, GA
 Client ID: Run#3Aer
 Analysis date: 09/11/2019 17:25:08
 Method: Direct Injection
 Description: CHANNEL 1 - FID
 Column: 1% SP-1000, Carbopack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto1-100.cpt
 Data file: 1CRBardCov2019-3A08.CHR (c:\peak359)
 Sample: Oxidizer Inlet
 Operator: D. Kremer



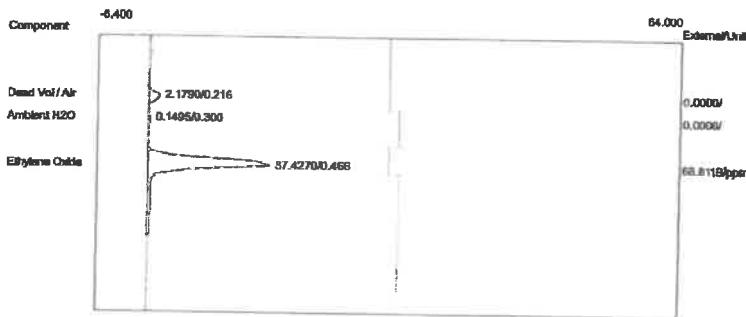
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1635	0.0000	
Ethylene Oxide	0.466	37.6205	69.1676 ppm	
		39.7840	69.1676	

Lab name: ECSi
 Client: CR Bard - Covington, GA
 Client ID: Run#3Aer
 Analysis date: 09/11/2019 17:25:08
 Method: Direct Injection
 Description: CHANNEL 2 - PID
 Column: 1% SP-1000, Carbopack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto2-100.cpt
 Data file: 2CRBardCov2019-3A08.CHR (c:\peak359)
 Sample: Oxidizer Outlet
 Operator: D. Kremer



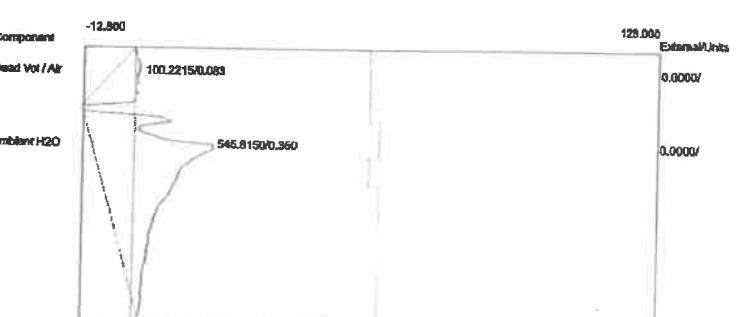
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	405.1430	0.0000	
		405.1430	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:30:17
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.term
Components: eto1-100.cpt
Data file: 1CRBardCov2019-3A09.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1790	0.0000	
Ambient H2O	0.300	0.1495	0.0000	
Ethylene Oxide	0.466	37.4270	68.8119	ppm
		39.7555	68.8119	

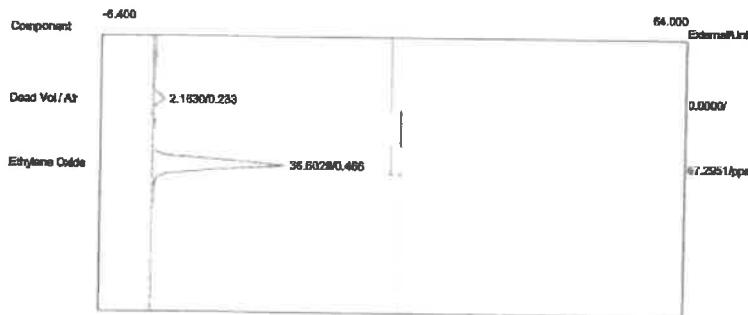
Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:30:17
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.term
Components: eto2-100.cpt
Data file: 2CRBardCov2019-3A09.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



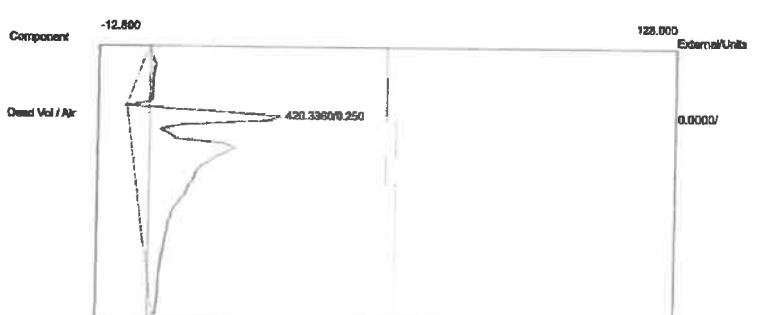
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	100.2215	0.0000	
Ambient H2O	0.350	545.8150	0.0000	
		646.0365	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:35:07
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-3A10.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:35:07
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-3A10.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



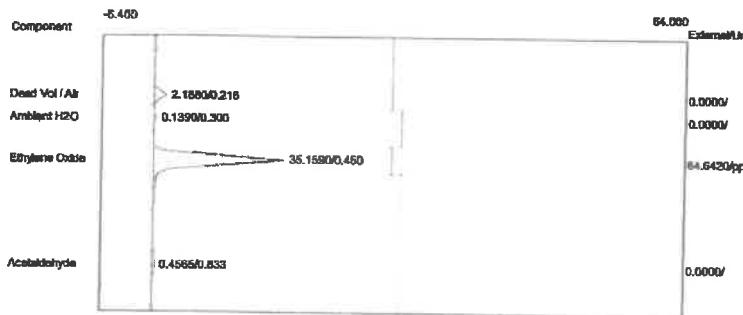
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1630	0.0000	
Ethylene Oxide	0.466	36.6020	67.2951	ppm
		38.7650	67.2951	



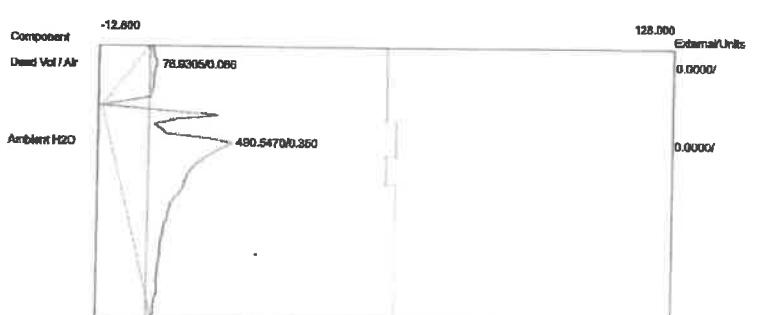
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	420.3360	0.0000	
		420.3360	0.0000	

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:40:09
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt
Data file: 1CRBardCov2019-3A11.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer

Lab name: ECSi
Client: CR Bard - Covington, GA
Client ID: Run#3Aer
Analysis date: 09/11/2019 17:40:09
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-3A11.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer

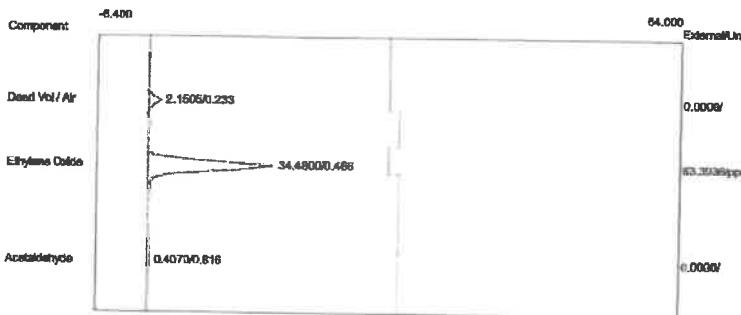


Component	Retention	Area	External	Units
Dead Vol / Air	0.216	2.1880	0.0000	
Ambient H2O	0.300	0.1390	0.0000	
Ethylene Oxide	0.450	35.1590	64.6420	ppm
Acetaldehyde	0.833	0.4565	0.0000	
		37.9425	64.6420	



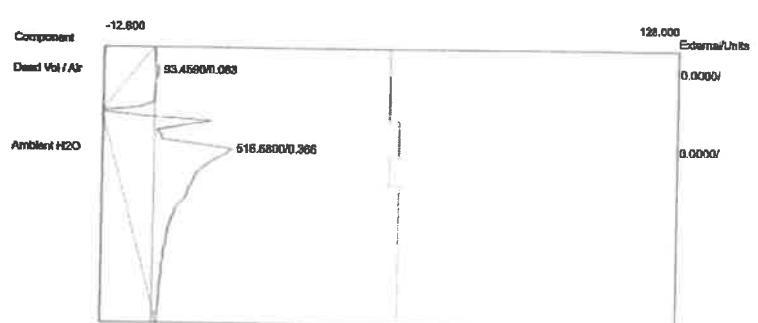
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	76.9305	0.0000	
Ambient H2O	0.350	490.5470	0.0000	
		567.4775	0.0000	

Lab name: ECSi
 Client: CR Bard - Covington, GA
 Client ID: Run#3Aer
 Analysis date: 09/11/2019 17:45:14
 Method: Direct Injection
 Description: CHANNEL 1 - FID
 Column: 1% SP-1000, Carbopack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto1-100.cpt
 Data file: 1CRBardCov2019-3A12.CHR (c:\peak359)
 Sample: Oxidizer Inlet
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.1505	0.0000	
Ethylene Oxide	0.466	34.4800	63.3936 ppm	
Acetaldehyde	0.816	0.4070	0.0000	
		37.0375	63.3936	

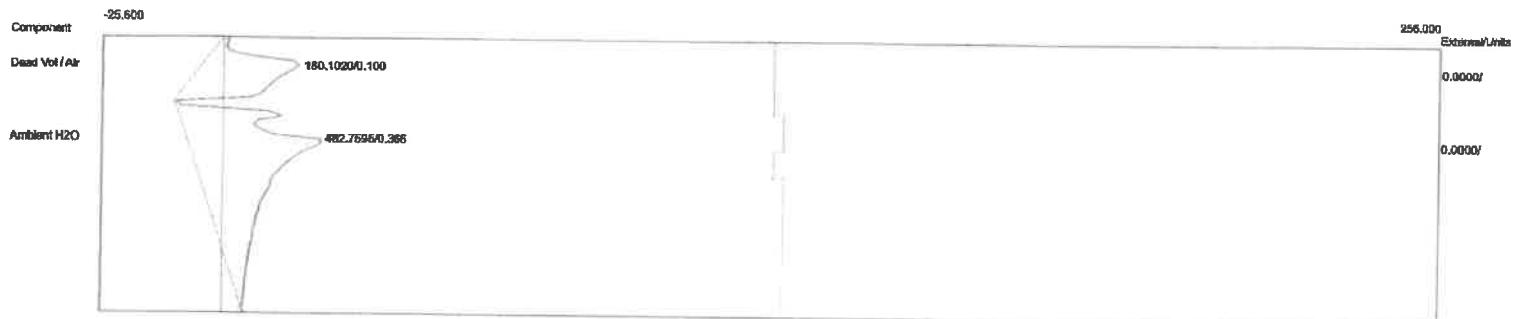
Lab name: ECSi
 Client: CR Bard - Covington, GA
 Client ID: Run#3Aer
 Analysis date: 09/11/2019 17:45:14
 Method: Direct Injection
 Description: CHANNEL 2 - PID
 Column: 1% SP-1000, Carbopack B
 Carrier: HELIUM
 Temp. prog: eto-100.tem
 Components: eto2-100.cpt
 Data file: 2CRBardCov2019-3A12.CHR (c:\peak359)
 Sample: Oxidizer Outlet
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.083	93.4590	0.0000	
Ambient H2O	0.366	516.6800	0.0000	
		610.1390	0.0000	

APPENDIX E
Run #1 Chromatograms – Exhaust

Lab name: ECSI
Client: CR Bard - Covington, GA
Client ID: Run#1Exh
Analysis date: 09/12/2019 10:16:04
Method: Direct Injection
Description: CHANNEL 2 - PID
Column: 1% SP-1000, CarboPack B
Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt
Data file: 2CRBardCov2019-1E01.CHR (c:\peak359)
Sample: Oxidizer Outlet
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.100	180.1020	0.0000	
Ambient H2O	0.366	482.7595	0.0000	
		662.8615	0.0000	